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Analyzing Capital Flow Drivers Using the 'At-Risk' Framework: South Africa's Case

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Abstract

Cross-border capital flows are important for South Africa. They fund the nation's relatively large external financing needs and have important financial stability implications evidenced by the large capital outflows and asset price selloffs during the COVID-19 pandemic. This paper adds to the literature on the drivers of South Africa's capital flows by applying the 'at-risk' framework—which differentiates between the likelihood of "extreme" inflows (surges) and outflows (reversals) and of "typical" flows—to both nonresident and resident capital flows. Estimated results show that among nonresident flows, the portfolio debt component is most sensitive to changes in external risk sentiment particularly during reversals. This applies to flows to the sovereign sector. Nonresident equity flows, both portfolio and FDI, are most sensitive to domestic economic activity especially during surges. This applies to flows to the corporate and banking sectors. Results also suggest that resident flows, in particular the FDI component, tend to offset nonresident flows, thus acting as buffers against funding withdrawal during periods of global risk aversion.

JEL Classification Numbers: C22, F21, F31, F32, G15

Keywords: Capital flows, capital flows at risk, COVID-19 pandemic, emerging markets, financial stability, quantile regression, South Africa.

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I. INTRODUCTION

Cross-border capital flows are relevant for emerging markets in general and particularly so for South Africa. External financing needs are relatively large, with gross external financing needs —the amount of funding and liquidity the economy needs to import—at almost 19 percent of GDP over the next three years. Historically, nonresident portfolio investment has been important for external financing. In particular, local currency government debt has been a key destination of nonresident inflows, lifting the share of nonresident holdings to relatively high levels. Capital inflows add to private investment from domestic sources—private investment is needed to enhance productivity and growth durably after growth has remained low for a protracted period amid unacceptably high unemployment, poverty, and inequality. In recognition of these benefits, the authorities have allowed free flow of nonresident capital in- and outflows as the cornerstone of South Africa's policy framework, while maintaining some restrictions on resident outflows A large domestic financial system and deep capital markets have attracted nonresident inflows.

During the COVID-19 pandemic, South Africa like most other emerging economies, witnessed large capital outflows. Net selling of local currency-denominated sovereign bonds by nonresidents was larger than in other emerging markets, pushing up local sovereign yields sharply and tightening interbank market liquidity conditions. Net nonresident portfolio outflows (bonds and equities) in 2020 were large, comparable to those during the global financial crisis.[1] The credit spreads on South Africa's dollar-denominated bonds more than doubled at one point, and the rand depreciated precipitously in early-April, reaching its weakest level on record. Demand for foreign currency funds picked up as agents either moved assets overseas or hoarded foreign currency domestically. Cross-border dollar funding conditions also tightened. South Africa was removed from the World Government Bond Index (WGBI) at end-April following the rating downgrade by Moody's in March; this was largely unrelated to the pandemic and likely amplified capital flow pressure.[2]

The authorities took swift policy response in a bid to mitigate negative effects of the pandemic. The South African Reserve Bank (SARB) took strong and timely action, progressively reducing the policy rate by cumulative 300 basis points in 2020 and ensuring adequate trading and funding liquidity conditions in the financial system (Shikwane et al.,2020). Through a supplementary budget, the government proposed a plan to reprioritize budget appropriations toward health and mitigation spending and devote additional budgetary outlays to protect the poor, the unemployed, and the most affected businesses. Once the health crisis subsides, the authorities intend to refocus on long-standing fiscal and structural issues to support the economic recovery, boost growth potential, reverse the rising trend in public debt, and foster greater inclusion.

Generally, cross-border capital flows can have a range of benefits but also carry risks. Foreign savings can be an important source of private investment to boost economic growth and increase consumer welfare by enabling households to better smooth consumption over time. Risks relate to capital flows' procyclicality and volatility. In particular, short-term debt flows are often volatile and even disruptive, posing challenges for policymakers, complicating monetary and exchange rate policies and potentially threatening financial

[1] Using 4-quarter rolling BOP and GDP data.

[2] See Arslanalp et al (2020) for a stock-taking of the benchmark driven investors in EM local bond markets.

stability. Risks also relate to the pace and modality by which the financial account is liberalized, as liberalization can lead to increased volatility (Kose and Prasad, 2020).

Against this backdrop, we deploy a unified framework to understand the drivers of various segments of capital flows in South Africa, paying attention to the "tails." The evolving capital flow cycle in South Africa (Annex Figure A7; Section IV for the framework) puts more emphasis on the likelihood of extreme inflows (surges) and outflows (reversals). The 'at-risk' framework and the quantile regression methodology are used to help understand the role of key external and domestic drivers in impacting the likelihood of these "extreme" flows, as opposed to the "typical" flows. The quantile regression methodology helps estimate the entire distribution of capital flows, as compared to a point estimate from the traditional regression methodologies, which are based on averages. This methodology usefully disentangles the varying sensitivity of capital flows to underlying conditions across the different phases of the capital flow cycle. This is particularly useful for South Africa, as the amplitude of its capital flow cycle has changed significantly over the years. This framework is used to generate capital flow projections over the next four quarters, or the "flow outlook," conditional on the current state. We have not included the policy responses as part of our specification given the data limitations, but it can be a useful extension of the paper.

Estimated results highlight contrasting roles of key global and domestic factors for "extreme" nonresident capital flows. The likelihood of weak nonresident flows (including reversals) is dictated more by global risk aversion shocks. This is particularly the case for nonresident portfolio debt flows, which appears more sensitive to global risk aversion shocks. By contrast, the likelihood of strong nonresident flows (including surges) is affected the most by domestic economic growth. This is particularly the case with equity flows—both FDI and portfolio equity—which are generally more sensitive to domestic growth. This is also reflected in sectoral flows. Flows to the sovereign sector, all in debt, are found to be more sensitive to global risk aversion shocks. On the other hand, high sensitivity of flows to the corporate sector, mostly in equity, to economic activity reflects the multiplier effect between corporate earnings growth and domestic GDP growth—as strong corporate earnings boost economic growth, which in turn support corporate earnings.

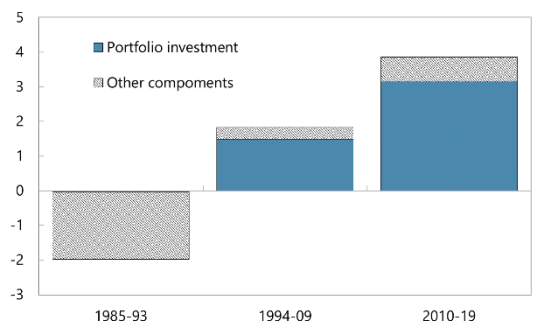
The analysis also finds that resident flows act as a strong buffer during risk-off episodes. Resident FDI inflows particularly strengthen in a countercyclical fashion in times of relatively high-risk aversion and large overall capital outflows. This can be due to intracompany transfer of assets, opportunistic reallocation of foreign assets to local assets with attractive valuation, or repatriation to meet regulatory limits when foreign assets exceed the thresholds in local currency terms. In addition, similar to their nonresident counterparts, resident FDI inflows tend to increase with domestic growth, as residents repatriate funds to leverage the stronger domestic activity (Appendix 1).

The rest of the paper is organized as follows. Section II discusses stylized facts regarding capital flows to South Africa. Section III summarizes the literature and highlights how this paper adds value. Section IV presents the estimation framework and data. Sections V presents estimated results while Section VI summarizes with policy implications and a way forward.

II. STYLIZED FACTS

As South Africa's integration to the global market has progressed, capital flows have gained in importance, supported by portfolio investment (Figure 1 and Annex Table A1).[3] Net capital flows were negative during the decade prior to the transition to democracy in 1994.[4] The financial account was –2 percent of GDP, driven by other investment. All components were either zero or negative. However, in the decade and a half flowing the end of apartheid, net capital flows turned positive, to nearly 2 percent of GDP on average. Portfolio investment was the most important component, representing 1.5 percent of GDP. Direct investment was similarly important (1 percent of GDP), likely supporting improvements in productivity and economic growth. During 2010–19, net capital flows rose further, to around 4 percent of GDP, supported mostly by portfolio investment of around 3 percent of GDP. Other investment also increased to 1 percent of GDP. By contrast, direct investment fell to zero, coinciding with a period of protracted low growth—relatively small (1 percent of GDP) nonresident inflows were counterbalanced by resident outflows

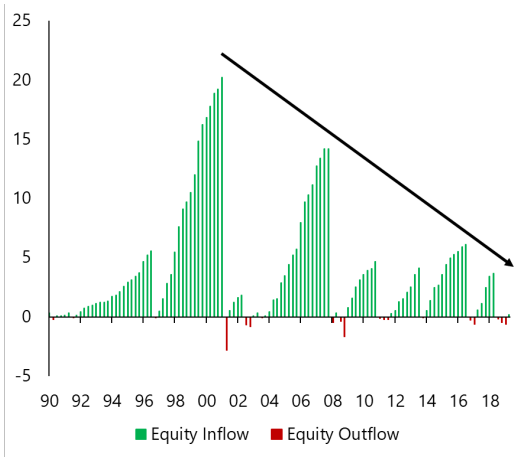
Figure 1. South Africa: Financial Account and its Composition (Percent of GDP)



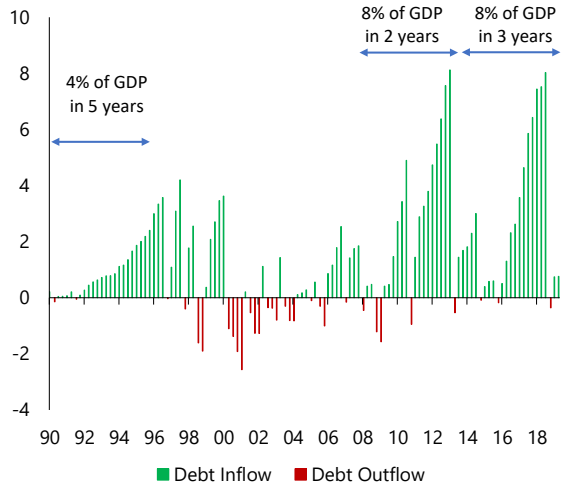
Sources: Haver Analytics, National Authorities, and IMF staff calculations. The figure plots period averages

Figure 2. South Africa: Nonresident Capital Flow Cycle
(Percent of GDP)

1. Portfolio Equity Flows



2. Portfolio Debt Flows



Sources: Bloomberg, IMF WEO, and IMF staff calculations.
Note: The bars show cumulative daily flows from the start of a cycle. They reset to zero as a new cycle starts.

The composition and amplitude of net nonresident portfolio inflows have changed significantly over the past two decades. The capital flow cycle is measured as the period during which net inflows continue to remain either positive or negative. Measured this way,

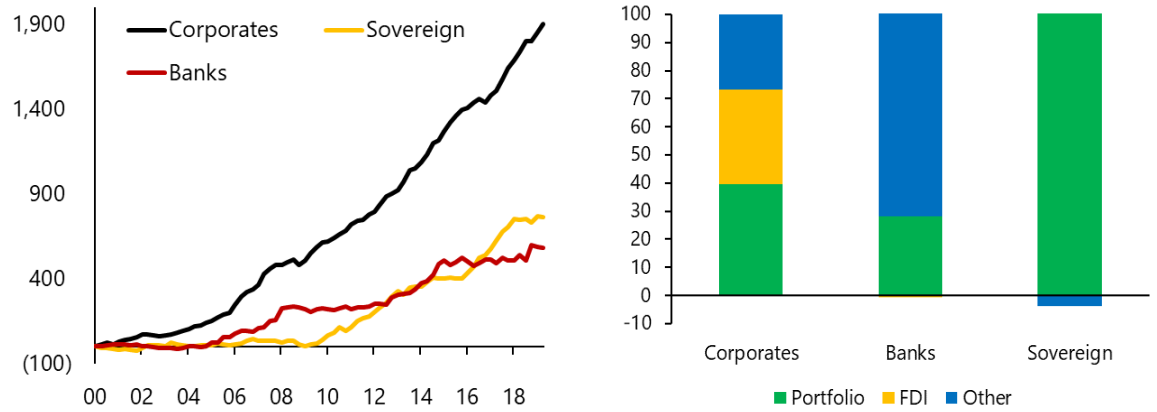
[3] The message is broadly unchanged when only liabilities (nonresident flows) are used.

[4] A positive sign in net capital flows increases International Investment Position. Net Non-resident capital flows are also referred to as 'Gross capital flows' in the literature.

the amplitude of nonresident portfolio equity flow cycle declined, from peak levels of 20 percent of GDP in the early 2000s to less than 5 percent of GDP in the last few years (Figure 2, panel 1). By contrast, the amplitude of portfolio debt flows (Figure 2, panel 2) increased—in the 1990s it took 5 years to accumulate 4 percent of GDP worth but in the last decade twice as much (8 percent of GDP) was accumulated in half the time (2–3 years).[5] The changing nature of capital flow cycles in terms of amplitude and duration highlights the importance of estimating capital flow drivers by accounting for changing typical and extreme flows. See Annex Figure A7 for flow cycles on the different types of the nonresident flows and Section IV for more details of the measurement framework.

Of total net nonresident inflows, corporate flows outpaced sovereign and bank flows in the last two decades. Corporate flows reached a cumulative R2 trillion during 2000–20 ($140 billion using the end-2020 exchange rate), more than double the R0.5–1 trillion of flows to the banking and sovereign sectors ($35–70 billion) (Figure 3, panel 1). Corporate flows are comprised of portfolio investment (mostly equity), FDI, and other investment flows. Banking flows are mostly composed of other investment flows (thus debt). Sovereign flows are dominated by portfolio debt investment (Figure 3, panel 2).

Figure 3. South Africa: Characteristics of Nonresident Sectoral Flows



Source: Haver, SARB and IMF staff calculations.

Reflecting strong capital inflows, nonresidents accumulated local asset holdings (Annex Figure A1). Consistent with the importance of portfolio investment in the financial account, the component represented the largest share of IIP liabilities in Q2 2020—nonresidents held more than 40 percent of GDP in local equities and more than 20 percent of GDP in South African government bonds (both in local and foreign currencies). In particular, nonresident holdings of local currency government bonds are one of the highest (as a share of total) in emerging economies (Figure 4, panel 1). However, after peaking in early-2018, the share declined steadily as reform expectations weakened, and more recently market volatility rose globally and fiscal risks worsened domestically amid COVID-19[6] (Figure 4, panel 2). Cross-border lending to and deposits in domestic institutions (other investment) were also important (more than 20 percent of GDP).

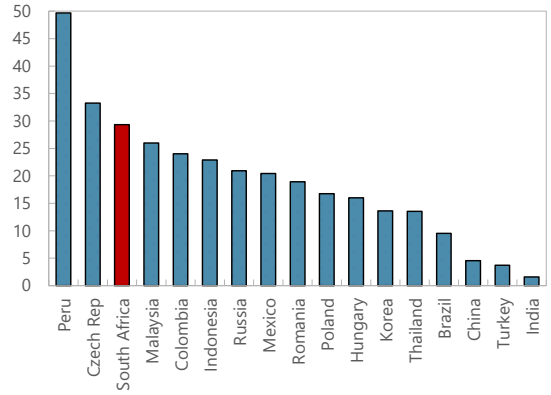
[5] This can be driven either by more frequent outflows (as looks to be the case for equity flows) or a decline in actual flows per year.

[6] This was potentially also impacted by South Africa's credit rating downgrade and its subsequent exit from a key global bond benchmark, which might have led to an exodus of benchmark driven investors.

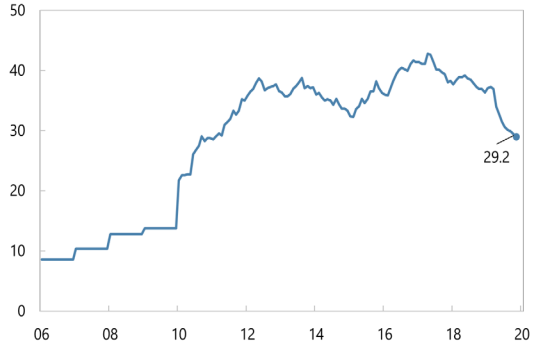
At the same time, domestic financial and non-financial corporates, which include large, sophisticated, and global players, have accumulated holdings of foreign assets (Annex Figure A2). In Q2, direct investment represented the largest share of the total stock of foreign assets held by South African residents, mostly in equities (85 percent of South Africa's GDP). This was followed by portfolio investment, also mainly in equities (56 percent of GDP)—nonbank financials hold large shares of foreign assets in equities. Bank holdings of deposits and debt abroad were 15 percent of GDP.

Figure 4. Nonresident Holdings of Local Government Bonds
(Percent share of total)

1. Comparison within major EMs
(Percent share of total; As of 2021 Q1)



2. South Africa Non-resident holdings
(Percent share of total)



Source: Haver, IIF, SARB and IMF staff calculations.

In recent years, resident inflows[7] (proxying the repatriation or divestment of resident assets) partly mitigated the impact of nonresident outflows. Looking at portfolio investment, resident and nonresident flows generally moved in the same direction (or positively correlated) in the 2000s and early-2010s, particularly during and after the 2008–09 global financial crisis. Since then, however, resident flows have negatively correlated with nonresident flows, acting as a buffer when nonresident flows turned negative[8] (Figure 5). The role of resident portfolio investment as a buffer was particularly pronounced during the COVID-19-related market volatility (Annex Figures A3, A8, and A9).

Figure 5. South Africa: Resident-Nonresident Portfolio Flow Correlation
(6 year moving correlation, using flows as a percent of GDP)

Sources: Haver Analytics and IMF staff calculations.

[7] This paper uses the term resident inflows to highlight the significance of the direction of flows from a balance of payments perspective. It effectively proxies the repatriation or divestment of resident assets and may also represent a slowdown in the resident outflows.

[8] This analysis doesn't take a view on the future nature of this relationship. As evidenced during the GFC episode, the negative correlation can become positive very sharply.

III. LITERATURE SURVEY

The literature finds that the drivers and the volatility of capital flows varies significantly across the different types of flows (see Koepke, 2019) for a survey of capital flow drivers). Debt flows are typically considered the riskiest (meaning the most volatile or reversible), while foreign direct investment (FDI) is deemed the safest (IMF, 2018; Korinek, 2018; and Ghosh et al., 2017). The residency of the investor also matters with nonresident investors tending to be more skittish than domestic investors (Forbes and Warnock, 2012; Ghosh et al., 2014; IMF, 2018).

In particular, the factors driving surges of portfolio flows to emerging markets may differ from factors driving reversals (Forbes and Warnock, 2012; Ahmed, 2017) shows that the sensitivity of capital flows with respect to growth differentials increases during strong capital flow episodes (surges). On the other hand, sensitivity of portfolio debt flows to global risk aversion[9] becomes more negative during weak capital flow episodes. Ghosh et al. (2014) argue that the push factors trigger whether inflow surges occur, while pull factors determine the direction and magnitude of surges.

Differentiating between "reversals" and "surges" is also relevant from a financial stability perspective, as they entail different risks. Surges tend to be accompanied by a domestic credit boom and currency appreciation which can in turn lead to asset price bubbles and increase financial sector vulnerabilities (Cecchetti et al., 2019; Gelos et al., 2019). In contrast, "sudden stops" can threaten financial stability through different channels including a tightening of financial conditions, decline in asset prices, and tighter bank lending conditions (Calvo and Reinhart, 1999; Guidotti, Sturzenegger et al, 2004; among many others).

The capital-flows-at-risk methodology emerged to complement prior literature. Past work has looked separately at the drivers of average capital flows, on the one hand, and, the drivers of capital flow surges and sudden stops, on the other. The capital-flows-at-risk approach considers the joint impact of multiple drivers on the entire predicted distribution of portfolio flows (IMF, 2018; Gelos et al., 2019; Goel and Papageorgiou, 2021; Brandao-Marques et al., 2020; and Chari et al., 2020).[10] Along with projecting the entire distribution of flows, the quantile regression framework also enables a differentiation between coefficient across different deciles—reflecting the impact across the different regimes of capital flows. This is similar in approach to the Growth-at-Risk analysis (IMF, 2017; IMF, 2018; Adrian et al, 2019). Growth-at-risk analysis has been used significantly to highlight the notable impact of current financial conditions to predict the risks to the forward growth dynamics, and how different vulnerabilities can act as an amplifier. This framework has also been deployed in country surveillance at the IMF, including in staff reports as well as multiple financial stability assessment programs (Prasad et al., 2019). Most work on capital-flows-at-risk focused on EM-wide capital flows from the perspective of nonresident investors. This paper is one of the first studies[11] that applies this methodology to a particular country and analyzes

[9] Global risk aversion measures the extent to which global investors prefer to tilt their portfolios to relatively risk-free assets. This is also meant to capture shocks that might be relevant for global assets, rather than just for select countries or idiosyncratic assets. We measure this using the implied volatility in US equities (VIX Index), which is a well-accepted index for measuring the extent of global risk aversion.

[10] For details of the capital-flows-at-risk methodology, see IMF (2020) and Gelos et al. (2019).

[11] Gelos et al. (2019) also discusses a few country cases however, the scope of our paper is much broader and deeper with respect to the drivers of flows, as well as the applications to a particular country.

the drivers across all categories of net flows (covering both resident and non-resident flows), thus covering a significant portion of the entire balance of payments. This paper also focuses exclusively on the macro-financial drivers of the capital flows, unlike Gelos et al. (2019) and Brandao-Marques et al. (2020) which also consider the impact of policy responses.

South Africa represents a useful country case for which to apply this framework. Our own analysis presented earlier in this paper highlighted how the composition and amplitude of net nonresident portfolio inflows have changed significantly over the past two decades. This is consistent with the literature on capital flow cycles (e.g., surges and reversals) documents the strength and persistence of capital inflows since the 2000s in South Africa. For instance, Rangasamy (2014) identifies periods of surges and stops in net capital inflows in South Africa using 5 decades of data spanning 1961–2011. The author identifies episodes of 5 surges and 4 stops. The final years of the sample (2004–11) represent a persistent surge, which, roughly extrapolating the approach, may have continued more than a decade into 2017–18.

The importance of common push and pull factors of capital flows have been studied in the context of South Africa. Gumata and Ndou (2019) include a number of research articles related to capital flows and growth in South Africa and highlight the role of external (global interest rates, implied equity volatility index - VIX) and domestic factors in driving capital flows in South Africa. One key domestic factor is confidence, which can amplify the impact of a negative shock (e.g., a sovereign credit rating downgrade) on growth, potentially through weaker capital inflows. IMF (2018) includes an extensive analysis of the drivers of flows to sub-Saharan African and highlights the difference between global and domestic factors, in particular for different types of flows. It finds that global factors play an important role in explaining the dynamics of financial flows. However, the relative importance of these factors depends on the type of flow, with portfolio flows generally being more sensitive to global market volatility. Domestic factors also matter as countries with strong macroeconomic performance are found to be less likely to experience large reversals of nonresident capital flows.

Strong domestic factors mitigated negative effects of capital flow volatility in South Africa's context. Sound domestic macroeconomic policies were the catalyst in navigating through the "rand crisis" in 2001 with limited macroeconomic repercussions, better than the one in 1998 (Bhundia and Ricci, 2005). A broader improvement in the overall macroeconomic policy framework helped strengthen policy credibility. The forward book had been progressively dismantled since 1998. Fiscal consolidation had been ongoing for several years and brought fiscal deficit to prudent levels. The adoption of an inflation targeting framework successfully provided a more credible nominal anchor for exchange rate expectations. However, economic performance weakened even prior to the onset of the COVID-19 pandemic on higher fiscal risks and remaining structural rigidities.

Relatedly, South Africa's idiosyncratic characteristics help mitigate negative effects of capital outflows but some call for caution. A historically weak causal link between capital inflows and domestic credit growth, and low currency mismatches on the domestic agents' balance sheet limit threats to financial stability stemming from capital flow volatility

(Hassan, 2016).[12] Literature also shows that the strong counterbalancing behavior of domestic resident capital flows is a major strength of South African economy. Smith (2019) shows that capital repatriation by domestic residents has prevented 4 sudden stops from occurring during times when foreign residents were responsible for large capital outflows. However, even in the absence of large FX mismatches, a reversal of capital outflows could tighten domestic liquidity conditions, dampen financial sector risk taking, reduce demand for financial assets, and negatively affect the domestic economy (Makrelov et al, 2019).

IV. FRAMEWORK AND DATA

A. Capital Flows At-Risk Framework

Quantile regressions are used to project the entire distribution of capital flows over the next four quarters (in line with the methodology adopted in IMF, 2018; Gelos et al., 2019; IMF, 2020). Such projections are made based on global and domestic factors in the current period. For example, changes in the global factor today may have a larger effect on the projected likelihood of extreme outflows than those of more typical flows and inflows. The analysis accounts for the distributional properties of the dependent variable (i.e., capital flows), that is, the non-linearities between weak and strong flow regimes. However, the analysis does not account for such properties of the independent variables (e.g., growth).

We focus on the lower tail, median, and upper tail of the distribution of predicted flows. The lower tail represents the average of estimated coefficients for up to the 30th percentiles, the median for between 40th to 60th percentiles, and the upper tail for the 70th and above percentiles (IMF, 2020; Online Annex). Figure 6, panel 1 shows illustrative results using data for 1990Q1–2019Q2 to highlight how to interpret the coefficients of capital flows. The left panel shows that a one unit change in the explanatory variable would increase capital flows by 0.05 percentage point of GDP during episodes of weak flows (first bar representing left tail), by 0.15 percentage points of GDP during "normal" flows (around median), and by 0.35 percentage points of GDP during episodes of strong flows (right tail).[13]

Importantly, weak flows in our analysis are relative to the historical trends and do not necessarily represent outflows. For instance, Figure 6, panel 2 shows that the distribution of banking flows is broadly symmetric around the vertical zero line, which implies that "weak flows" represent strong outflows, "median flows' around zero, and "strong flows" large inflows. On the other hand, for corporate flows, the distribution of which is skewed to the right, both median and strong flows represent inflows, while weak flows proxy outflows.[14]

[12] Hassan (2016) argues measures to restrict capital outflows may not be effective in the light of large volumes of FX and fixed income derivatives trading (which can be used to circumvent restrictions) and offshore rand trading (more trading can move offshore).

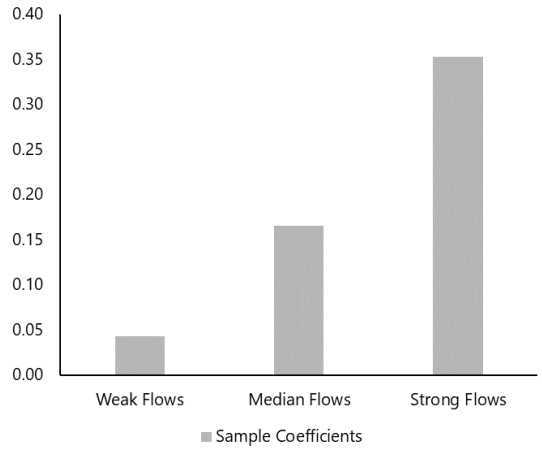
[13] Assuming the analysis is state independent, i.e., flows do not change the state they are in after this shock. Further analysis needs to be done to assume state changes which is a notable extension of this project.

[14] See Annex 1 for the historical distributions on all types of flows considered in this paper. The capital flow distributions are also plotted across many charts, including Figures 7 and 13 which highlight the probability density functions on the y-axis, and capital flows (as a percent of GDP) on the x-axis.

Figure 6. Sample Output Representations

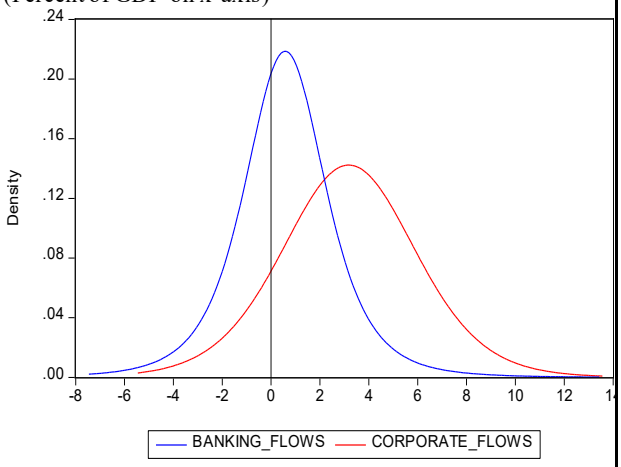
1. Sample Coefficients for portfolio flows

(Percentage point of GDP)



2. Sample Portfolio Flow Distribution

(Percent of GDP on x-axis)



Sources: Haver Analytics and IMF staff calculations.

Specification

Let $\bar{y}_{i,t+1:t+h}$ denote the average portfolio inflows to country *i* (in percent of GDP) in the quarters *t*+1,…*t*+*h*, where *t* stands for current quarter.

Our baseline regression is specified as follows:

$$\bar{y}^{\alpha}_{i,t+1:t+h} = \gamma^{\alpha}_{i} + \beta^{\alpha}_{1} Global_{t} + \beta^{\alpha}_{2} Domestic_{i,t-1} + \beta^{\alpha}_{3} TimeControls + e \quad (1)$$

for α=0.05, 0.1, 0.15, …, 0.95; where e is the residual term

For this paper, we have taken h = 4, representing the average flows over the next one year (this is also referred to as near-term portfolio flow outlook in Gelos et al, 2019).

The superscript α stands for the percentile at which the regression is estimated. In a general quantile regression of a variable $\bar{y}_{t:t+h}$ on a vector of controls x_t , $\bar{y}_{t:t+h} = \delta^{\alpha} x_t$, the regression slope δ^{α} is chosen to minimize the quantile-weighted absolute value of errors:

$$\hat{\delta}^{\alpha} = \text{argmin} \sum_{t=1}^{T-h} (\alpha \times 1_{\bar{y}_{t:t+h} > x_t \delta} |\bar{y}_{t:t+h} - x_t \delta| + (1-\alpha) \times 1_{\bar{y}_{t:t+h} < x_t \delta} |\bar{y}_{t:t+h} - x_t \delta|) \quad (2)$$

where $1_{(\cdot)}$ denotes the indicator function. The predicted value from that regression is the percentile of $\bar{y}_{t:t+h}$ conditional on x_t. In this application, equation (1) is estimated for a range of percentiles from the 5th to the 95th percentile. Estimates are then used for a range of percentiles to construct an empirical distribution of predicted average portfolio flows[15].

$Global_t$ is a vector of global "push" factors, $Domestic_{i,t}$ stands for country-specific factors in country *i* at time *t*, that have been considered as "pull" drivers in the literature. 'Push' variables are the global metrics that impact portfolio flows. For the purposes of this paper, we have proxied the push factors using the VIX Index which represents the global investor

[15] The analysis was replicated using standardized variables for some segments and the results are corroborated.

risk appetite.[16] The pull variables are the 'domestic' factors and proxied by two variables. Domestic real GDP growth captures the real economy channel for capital flows. Domestic financial conditions, on the other hand, capture the financial channel—for instance, portfolio flows generally chase returns. We use the most important drivers of portfolio flows guided by the literature (Koepke, 2019).

We also fit the empirical distribution to a skewed-t probability distribution (proposed by Azzalini and Capitanio, 2003; and in line with Adrian, 2019; Gelos, 2019; and IMF 2020)—which is characterized by 4 moments: mean, variance, skewness, and kurtosis. The skewed-t distribution nests both normal and standard t-distribution, and thus it allows us to stay broadly agnostic about the shape of the distribution of future flows.

B. Data

The quarterly data on non-resident and resident capital flows is sourced from IMF Balance of Payments database and Haver Analytics, expressed in percent of GDP, and span Q1 1990–Q4 2019. Nonresident sectoral capital flow data are procured from the national authorities. VIX and domestic growth (year on year) are sourced from Bloomberg.

Domestic financial conditions are sourced from IMF (2018). Financial conditions are aimed at capturing the price-of-risk components, using the financial variables, without taking balance sheets or vulnerabilities into account (Figure 7). The weights are fixed and calculated using a principle component analysis. For more details, refer IMF (2018).

Figure 7. List of Variables Considered While Creating the Financial Conditions

Variable	Measurement	US, Germany	Other AE	EM
real short-term interest rate	3 month T-bill yield minus CPI yoy	1	1	1
interbank spread	Interbank rate (Libor) minus T-bill yield	1	1	1
term spread	5-year govt bond yield minus T-bill yield	1		
sovereign local debt spread	5-year yield minus US or Germany yield		1	1
sovereign dollar debt spread	EMBI spread			1
corporate local currency spread	ICE OAS	1	1	1
corporate dollar debt spread	CEMBI spread			1
equity prices	MSCI P/B	1	1	1
equity vol	VIX/V2X/VNKY	1		
exchange rate	debt-weighted exchange rate			1
real house prices	BIS house prices yoy minus CPI yoy	1	1	1

Source: IMF (2018).

C. Pitfalls and Caveats

While this 'at-risk' framework is very useful to understand the difference in variables across flow percentiles and for plotting the predicted distribution of flows, this is still a static OLS approach and might not be able to capture feedback effects and the persistence of explanatory variables. Secondly, some of the assumptions including state dependency might now always hold true and thus extensions of this paper need to be explored further. Thirdly, data sample needs to be large enough to allow for a robust analysis and adding more metrics in the base

[16] VIX is the most widely used proxy for measuring global risk aversion. Papers like Gelos (2019) and IMF (2020) highlight that alternative measures of risk aversion like BBB corporate spread have also corroborated the results. It will be a useful extension to analyze the differentiating impact of the multiple risk aversion variables.

specification (including policy variables). This can have an impact on the statistical significance of select percentiles, as well as potentially lead to an omitted variable bias.

D. Horizon Matters

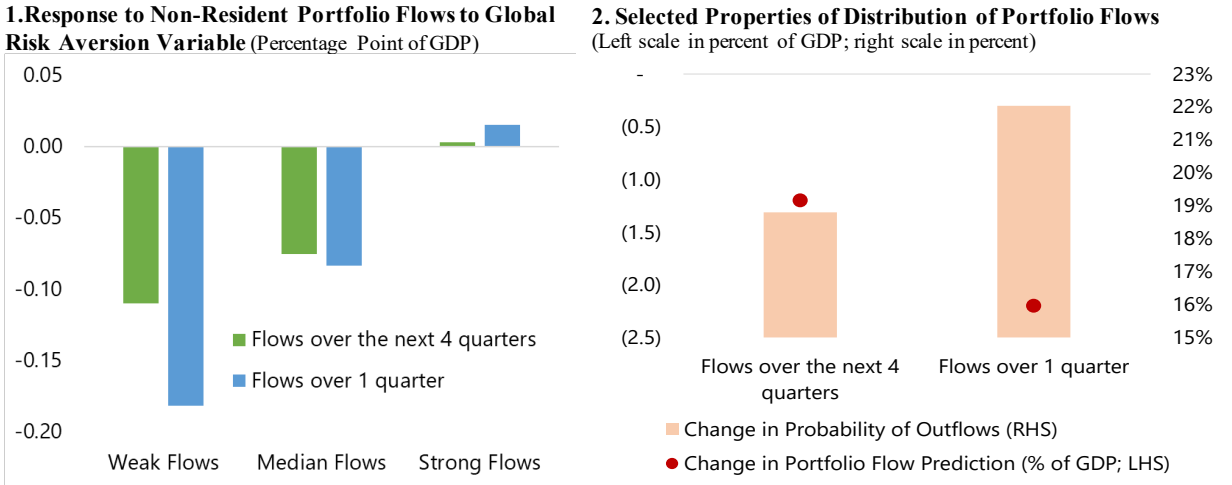
For the purposes of this paper, we have analyzed the drivers of the portfolio flows over the next four quarters. While this helps provide a good proxy of near-term portfolio flows (as also used in IMF, 2020; Goel and Papageorgiou, 2021 and Gelos, 2019), it might smooth out some of the results and understate the very near term impact (for example over the next one quarter).

- Figure 8, panel 1 plots the coefficient of non-resident portfolio flows to a global risk aversion shock. The impact over the next one quarter (in blue) is significantly larger than then impact over the next four quarters (in green), potentially reflecting the mean reversion properties of capital flows.

- Figure 8, panel 2 plots the change in selected properties of the distribution of portfolio flows after a 2 standard deviation shock to global risk aversion. The analysis shows that the mode of the distribution declines by 2.2 percent of GDP in the next one quarter vs just 1.2 percent of GDP over the next four quarters. Relatedly, the probability of outflows rises by 22 percent over the next one quarter vs 18 percent over the next four quarters.

Comparison of drivers across multiple horizons, would be a valuable extension of this paper.

Figure 8. South Africa: Difference in Sensitivities for Flows across Different Horizons



Sources: Bloomberg, Haver Analytics, and IMF staff calculations.
Note: Right panel = The analysis assumes a two standard deviation rise in VIX, and plots the change in the selected properties of the distrbution between the baseline vs. the shock scenario.

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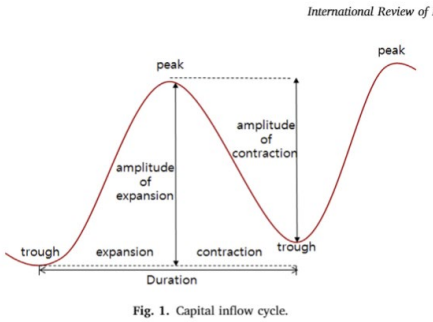
E. Capital Flow Cycle Measurement Framework

Capital flow cycle can be measured in multiple ways. For the purposes of this paper, the capital flow cycle is measured as the period during which flows continue to remain either positive or negative. As soon as the capital flow changes a sign, that indicates a change in the cycle from inflow to outflow (or vice versa). Correspondingly, amplitude is defined as the total cumulative flows until a turning point. Park. H (2018) discusses an alternative definition of cycle used in the capital flows content, where a cycle refers to a period in which capital inflows increase until a peak and then decrease until they reach a trough (Figure 9). In this context, our paper adopts a more stringent definition of the turning points.

Figure 9. Example of Capital Flow Cycle Measurement Framework



Sources: Park H (2018)

V. Estimated Results—Drivers of Capital Flows

Capital flow distributions are projected with respect to two different shocks (VIX, domestic output growth) using the capital flows at risk framework, paying attention to distributional impacts on typical flows (mode), and in and outflows (tail risks). This is done by analyzing different types of flows as follows:

- Nonresident flows: Total (section A), and by type (section B), that is, portfolio (further split into equity and debt), FDI, and other investment.
- Nonresidents flows by sector: corporate, banking, and sovereign (section C).
- Resident flows by type: Total, portfolio, FDI, and other investment flows (section D).

A. Nonresident Total Flows

Results highlight the extent to which effects of shocks on tail risks (reversals or surges) could vary considerably from those on the mode ("typical flows"). We present the results in terms of bell curves (Figure 10, panel 1) and selected statistics—mode (bars) and the tail risk of capital outflows (dots) (Figure 10, panel 2).

- In response to a rise in global risk aversion by 2 standard deviations, the distribution of nonresident capital flows shifts to the left and the probability of outflows nearly doubles from 5 percent in the baseline to 10 percent (Figure 10, panel 1, blue line; and panel 2, second bar/dot).[17]

[17] Total nonresident flows include relatively more stable FDI flows. For nonresident portfolio flows, which are more volatile, results from a comparable analysis suggest a rise in the probability of an outflow from 10 percent in baseline to almost 30 percent.

- A rise in domestic growth by 2 standard deviations moves the distribution of nonresident capital flows significantly to the right but the probability of outflows remains little changed (yellow line and third bar/dot). The positive impact of stronger domestic growth on capital flows is large during surges but relatively limited during times of weak flows.

- When domestic financial conditions tighten by 2 standard deviations, the mode of the distribution remains unchanged, but the probability of outflows declines materially (green line, fourth bar/dot). One interpretation is that domestic policy rate tightening could reduce the risk of large capital outflows.[18]

As another way to summarize the results, the underlying coefficients are studied. Figure 11 shows average coefficients for each part of the distribution—left tail, mode, and right tail.

- During periods of risk aversion, a vicious cycle and contagion amplify the initial negative shock to risk sentiment. Panel 1 shows that higher global risk aversion is negative for the flow outlook, as all bars are negative. Moreover, the size of the coefficients is significantly larger for the 'weak flows' regime (left bar), implying that global risk aversion shocks tend to play a more important role during flow reversals.

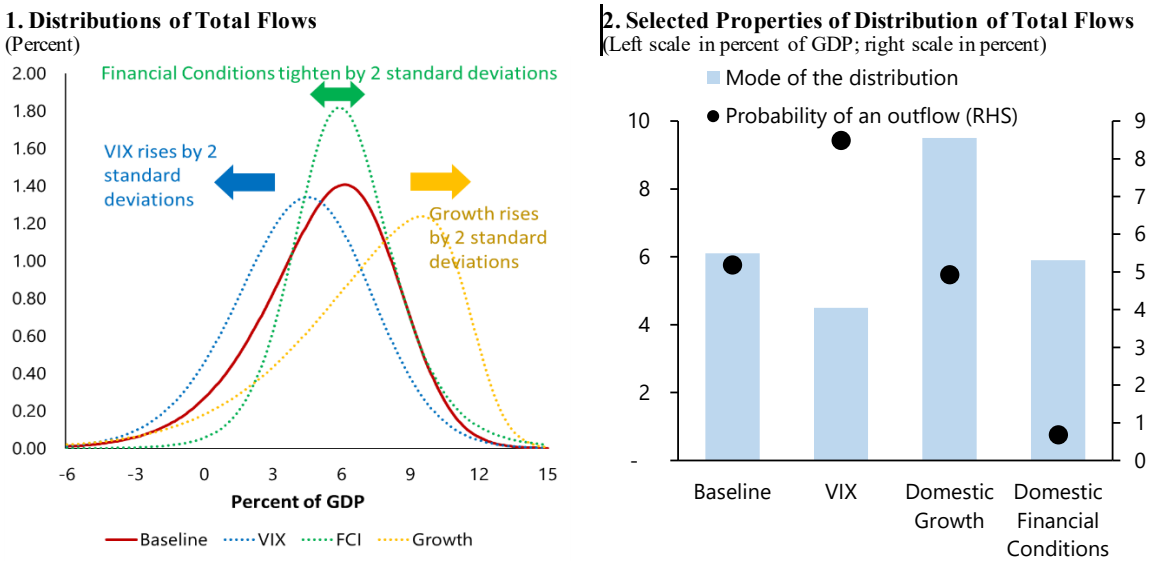
- Strong domestic growth has a relatively limited impact in containing capital flow reversals but can boost prospects for surges. Panel 2 shows that domestic growth has a positive impact on the capital flow outlook across the distribution, and especially so in the 'median' and 'strong' flows regime.

- Tightening of domestic financial conditions, potentially reflecting a higher domestic policy rate, helps support capital flows in both weak and strong flow regimes. Panel 3 shows that tighter domestic financial conditions tend to increase capital flows in both 'weak' and 'strong' flow regimes. They particularly help limit the likelihood of capital flow reversals.

In what follows discussions are based on estimated coefficients, similar to those in Figure 11.

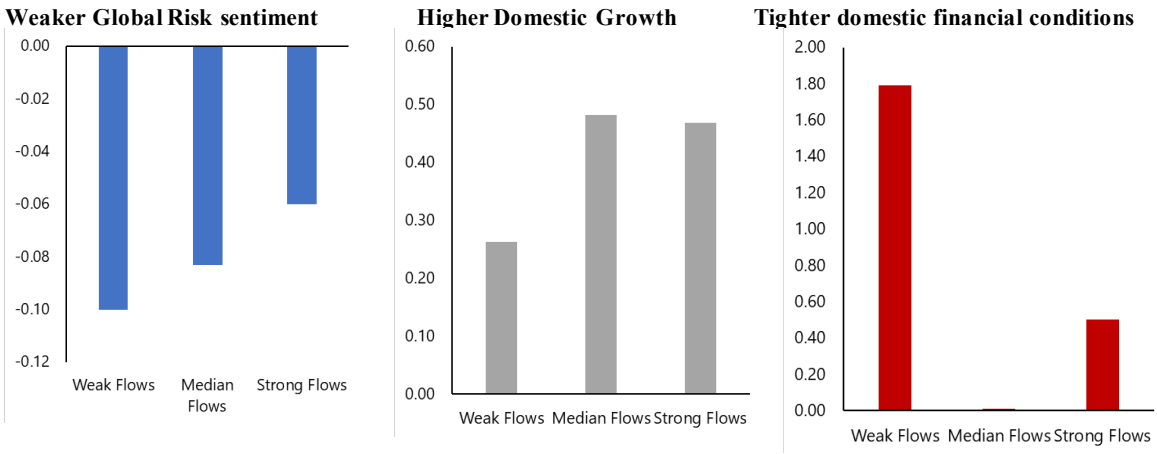
[18] This might also reflect the fact that carry factor is a key consideration for investments in debt assets of emerging markets.

Figure 10. South Africa: Scenario Analysis of Total Nonresident Capital Flows



Sources: Bloomberg, Haver Analytics, and IMF staff calculations.
Note: Right panel = The analysis assumes a two standard deviation rise in VIX, domestic growth and a two standard deviation tightening in domestic financial conditions.

Figure 11. South Africa: Distribution of Response of Nonresident Capital Flows (Estimated coefficients for the different variables)



Sources: Bloomberg, Haver Analytics, and IMF staff calculations.
Note: The bars represent response of total nonresident flows to a unit increase in the respective variables. Y-axis is in percent of GDP terms.

Economic Significance

The mode of the distribution for the total flows changes from 6 percent of GDP in baseline to 4.5 percent of GDP in the global risk aversion shock, and 9.5 percent of GDP in a higher domestic growth shock. This change of 1.5[19] and 3.5 percent respectively compares with historical standard deviation of 2.8 percent of GDP (for the four-quarter average in Annex Figure 9) and is thus economically significant.

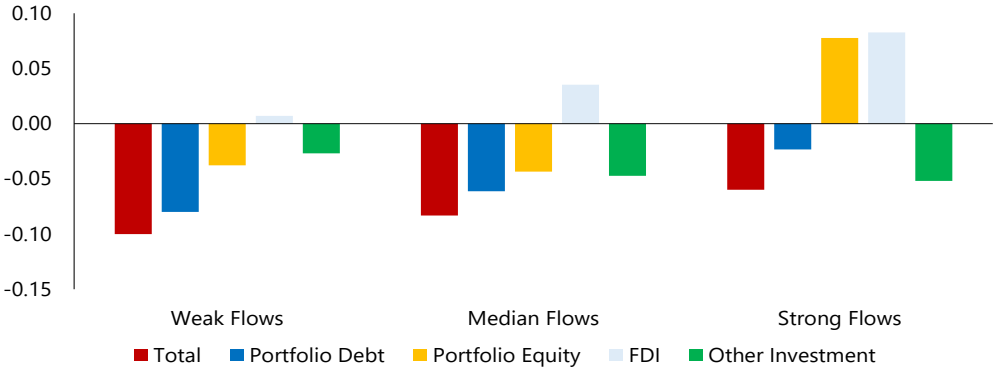
[19] This might understate the economic impact because this is calculated over four quarters.

B. Nonresident Flow by Component

Impact of Higher Global Risk Aversion

A rise in global risk aversion has a negative impact on nonresident portfolio flows, with a significant difference across the capital flow distribution (Figure 12). Portfolio flows are more sensitive to global risk aversion than total flows, particularly during periods of weak flows. This is consistent with the view that portfolio flows tend to be held by flightier investors and therefore more volatile (IMF, 2018). The response of portfolio flows to higher global risk aversion declines from periods of weak flows to those of strong flows, similar to total flows, but with stronger sensitivity. Remarkably, during periods of strong flows, portfolio flows respond little to a rise in risk aversion—within portfolio flows, a rise in equity flows offset a fall in debt flows (see next paragraph).

Figure 12. South Africa: Response of Nonresident Flows to Weaker Global Risk Sentiment
(Percentage Point of GDP)[20]



Sources: Bloomberg, Haver Analytics, and IMF staff calculations.
Note: The bars represent estimated coefficients with respect to one unit rise in VIX.

Within portfolio flows, debt flows are more negatively impacted by higher global risk aversion than equity flows, especially during periods of weak flows (Figure 12, blue and yellow bars). The results are consistent with Ahmed (2017) which argues that the coefficient of portfolio debt to global risk aversion becomes more negative during low episodes. The impact on equity flows is similarly negative during weak and median flows, even though with smaller sensitivity than debt flows.[21] Surprisingly, equity flows respond positively to a rise in risk aversion during times of strong flows, due potentially to a shortening the portfolio flow cycle, consistent with Gelos et al. (2019).[22] The positive coefficient of FDI flows during strong flows regime is consistent with Ahmed (2017) reflecting investors' preference for FDI when risk aversion increases. Other investment flows (Figure 12, green bars) are also negatively impacted by higher global risk aversion, but their sensitivity is higher in the strong flows regime. The weak flow coefficients for total and portfolio debt flows are equivalent to

[20] The analysis was also conducted using standardized variables and the results are corroborated.

[21] The higher sensitivity of debt flows vs equity flows is broadly in line with priors. Ostry et al. (2010) argue that debt liabilities offer limited risk sharing between the debtor and the creditor and rank different types of flows in the following order of riskiness: foreign-currency debt, local-currency debt, portfolio equity, and FDI. Forbes and Warnock (2012) also provide evidence of the fickleness of debt flows (including bank flows), as opposed to equity flows (including FDI).

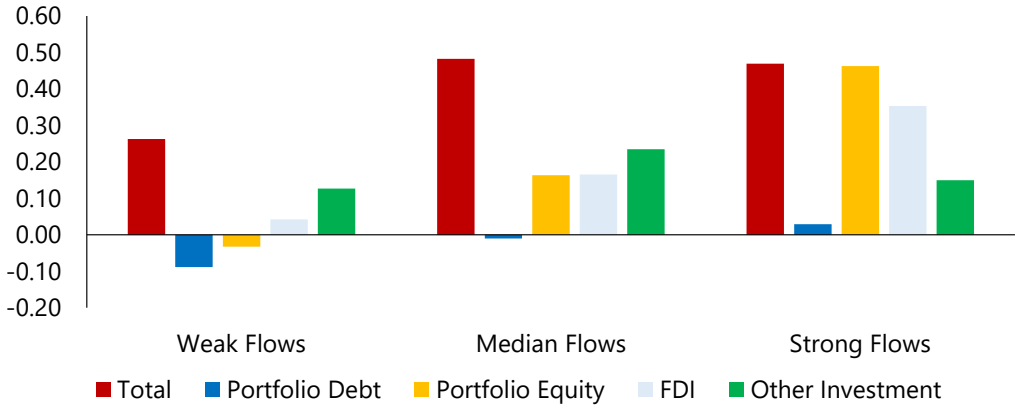
[22] See Annex 2, Chart 2. A higher risk aversion results in portfolio outflows for 1–2 quarters. Due to mean reversion such capital outflows are followed by capital inflows during the latter part of the projection horizon (four quarters).

outflows between 1.2–1.5 percent of GDP, under a 2 standard deviation shock, reflecting the extent of economic impact and significance.

Impact of Higher Domestic Growth

Total flows benefit from stronger growth, particularly during periods of strong flows (Figure 13, red bars). Equity flows benefit significantly more than debt flows from stronger growth, particularly during periods of strong flows (Figure 13, blue vs. yellow).[23] The results are consistent with Ahmed (2017) which argues that the sensitivity of capital flows towards growth differentials increases during high episodes, and this effect is statistically significant for portfolio equity flows. FDI flows are highly levered to domestic growth, particularly in the strong flow regime, consistent with Yeyati and Zuniga (2016) and Koepke (2019).

Figure 13. South Africa: Response of Nonresident Capital Flows to Higher Domestic Growth
(Percentage Point of GDP)



Sources: Bloomberg, Haver Analytics, and IMF staff calculations.
Note: The bars represent estimated coefficients with respect to one ppt rise in domestic growth.

Portfolio flow response to higher growth is limited during periods of weak flows but turns positive during periods of median and strong flows.[24] Within portfolio flows, equity flows benefit significantly more from higher domestic growth than debt flows (Ahmed, 2017). This potentially reflects the multiplier effect of domestic growth on corporate earnings which drives equity flows. Other investment flow sensitivity to domestic growth is relatively strong and stable across capital flow distribution (Figure 13, green bars). Koepke (2019) argues that these flows proxy banking flows, which are highly levered to the domestic growth prospects.

The strong flow coefficients for total and portfolio equity flows are equivalent to inflows worth almost 1.5 percent of GDP, under a 2 standard deviation rise in domestic growth, reflecting the extent of economic impact and significance.

Impact of Tighter Domestic Financial Conditions

Tighter domestic financial conditions have a mixed impact across the various types of flows (Figure 14). Tightening of domestic financial conditions leads to higher portfolio debt flows

[23] The results are in line with the findings in IMF (2020) and De Bock et al (2020), with similar conclusions for emerging economies broadly.

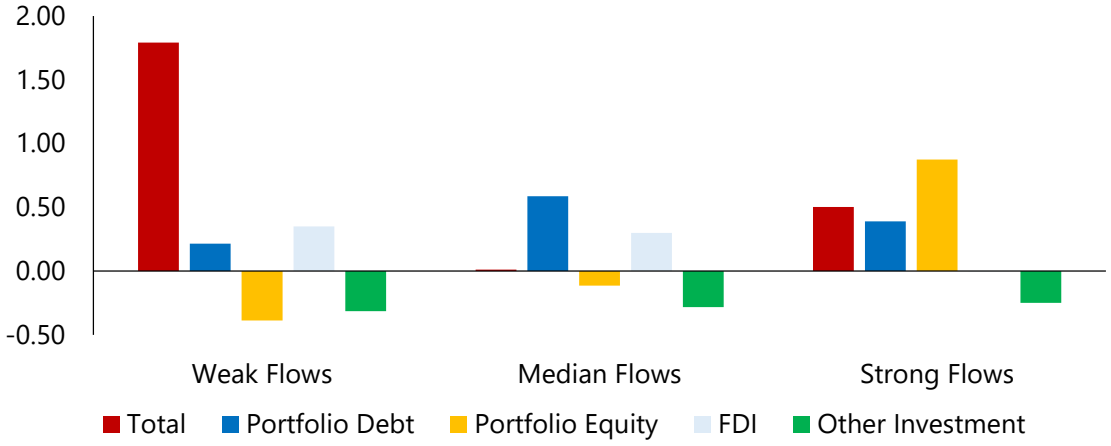
[24] Portfolio flows benefit less from higher domestic growth during the weak flows regime and these flows as a share of GDP decline.

likely as higher yields attract investors (Figure 14, blue bars). This also suggests domestic policy rate hikes could reduce the risk of large outflows.[25] Effects of tighter financing conditions on portfolio equity flows differ significantly across capital flow distribution. During periods of weak capital flows, equity flows fall as negative effects from lower economic growth appears to dominate (Figure 14, yellow). By contrast, during periods of strong capital flows, equity flows increase potentially representing the rebound from a decline in previous quarters.[26] The results are roughly consistent with Ahmed (2017) which argues that the sensitivity of portfolio equity flows towards interest rate differentials rise during strong flows period. FDI flows are also found to increase in response to tighter financial conditions, especially during the weak and median flows regimes.

The weak and strong flow coefficients for total flows are equivalent to inflows between 0.4–1.8 percent of GDP, under a 2 standard deviation tightening in domestic financial conditions, reflecting the extent of economic impact and significance.

Figure 14. South Africa: Response of Nonresident Flows to Tighter Domestic Financial Conditions

(Percentage point of GDP)



Sources: Bloomberg, Haver Analytics, and IMF staff calculations.
Note: The bars represent estimated coefficients with respect to one unit rise in the domestic fiancnial conditions index.

[25] This sensitivity is also reflected in the trends over the last six months, where market has started pricing in higher policy rates over the next few years—and that has coincided with a stabilization of the local currency debt flows to South Africa.

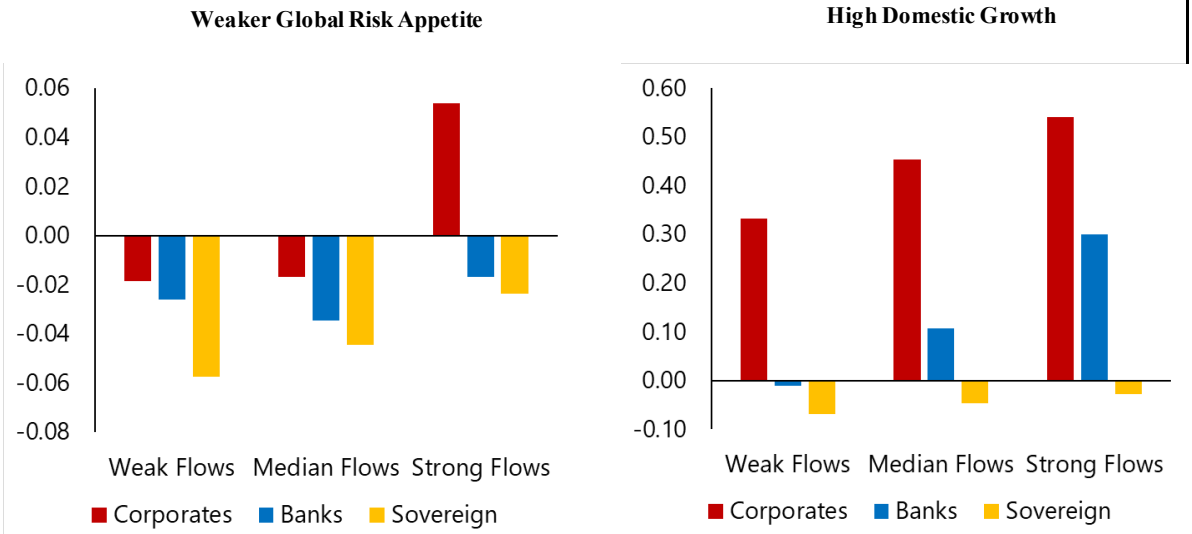
[26] It is key to note that the financial condition index can tighten due to multiple factors including for instance, tighter policy rates, or wider external spreads or a domestic equity selloff. Each of these factors will have a different impact on the flows. Thus, further work needs to be done to analyze the impact of each of these underlying drivers on the various capital flows (IMF, 2018).

C. Nonresident Flows by Sector

Global risk aversion shocks affect sovereign sector flows the most while growth shocks impact corporate sector flows the most (Figure 15, panel 1). This is consistent with earlier findings that debt flows are more sensitive to VIX (sovereign sector flows are all in debt) and the observation that inflows to the sovereign sector were strong in the last decade when global risk aversion was low (Figure A7, panel 6). Corporate sector flows, which include FDI and equity portfolio flows, are most sensitive to domestic growth shocks (Figure 15, panel 2). Growth improvement has a multiplier effect on corporate earnings and attract inflows to the corporate sector. The response of banking sector flows is somewhere in the middle as they consist of both debt (other investment) and equity (portfolio investment) flows.

The analysis also corroborates the distributional results from the previous sections. Higher global risk aversion significantly dampens sovereign sector flows, especially during periods of flow reversals[27]. Higher domestic growth, on the other hand, has a stronger impact during flow surges on both the corporate and banking flows, while little on the sovereign flows.

Figure 15. South Africa: Response of Sectoral Nonresident Capital Flows
(Percentage point of GDP)



Sources: Bloomberg, Haver Analytics, and IMF staff calculations.
Note: The bars represent estimated coefficients with respect to one unit rise in the VIX (left panel) and one ppt rise in the domestic growth (right panel).

[27] This is also reflected in the post COVID sell-off episode where foreign ownership has declined materially, leading to domestic institutions buying the local currency debt. This has led to an elevated risk of a bank-sovereign nexus (see forthcoming FSAP). Anecdotal evidence suggests that these factors could potentially diminish bank's capacity to warehouse sovereign risk and therefore their absorption capacity.

D. Resident Flows, Total and By Component

Total flows: Resident flows respond differently from nonresident flows, highlighting the role of resident flows in providing a buffer for the economy.[28]

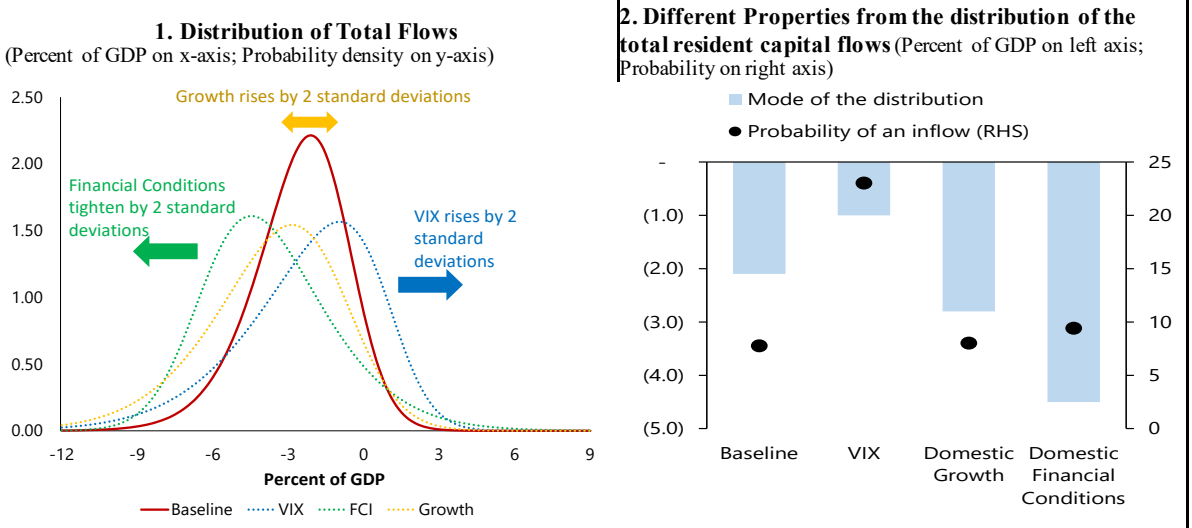
- When global risk aversion rises by 2 standard deviations, the distribution of total resident flows (Figure 16, chart 1 blue) moves to the right from the baseline, with the probability of an inflow[29] rising from 8 percent to almost 25 percent (Figure 16, panel 2, second dot). This contrasts with how nonresident flow distribution shifts to the *left*, *reducing* the probability of inflows and increasing the probability of outflows (Section C above).

- Similarly, higher domestic growth has a mixed impact on resident flows (Figure 16 panel 1, yellow); This is also visible in Figure 16, panel 2 (third dot) where the probability of inflow remains broadly unchanged, but the mode has become more negative. This is in contrast to having a clear, positive impact on nonresident flows.

- Tighter domestic financial conditions lead to higher resident outflows (the mode shifts to the left in Figure 16, panel 1, green)—however, the probability of inflows remains broadly unchanged (Figure 16, panel 2, fourth dot).

While the buffering role provided by the resident investors is reflected through the historical data (Appendix 1) as well as the empirical analysis, it is important to note that this relationship may change in the future especially if there is a material change in the financial structure of the economy. Furthermore, while this result holds true for South Africa, it is not necessarily true for all other EMs (since it might also be dependent on the extent of dollarization in the economy).

Figure 16. South Africa: Scenario Analysis of Total Resident Capital Flows



Sources: Bloomberg, Haver Analytics, and IMF staff calculations.
Note: Right panel = The analysis assumes a two standard deviation rise in VIX, domestic growth and a two standard deviation tightening in domestic financial conditions.

[28] As argued by Tarashev et al. (2016), a balanced current account with offsetting flows and positions may provide a false sense of safety. While asset repatriation might help the balance of payment dynamics, it might not completely dampen the negative effects of sudden nonresident outflows on domestic financial conditions and more broadly on growth.

[29] In contrast with the analysis on the non-resident flows where we focused on the probability of outflows, this analysis focuses on the probability of inflows, which captures the extent of buffering provided by resident flows.

By component

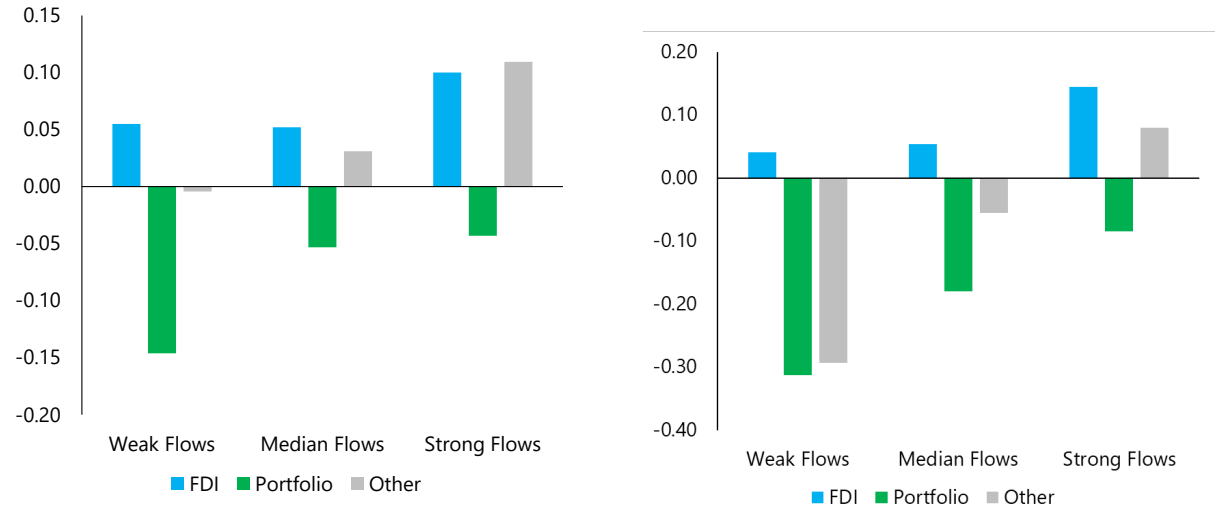
Higher risk aversion

Resident FDI and other investment work as a buffer, rising in times of higher global risk aversion, which is reflected through the positive coefficients for these flows in Figure 17, panel 1. In terms of the distribution across the FDI flows, the coefficient is positive across the different flow regimes, but is relatively more positive in the strong flow regime[30] (Figure 17, panel 1, blue bar; also look at Figures A7–A9). The positive response of resident other investment potentially reflects the intracompany transfer of assets between subsidiaries and headquarters (Duce, 2003)) and opportunistic repatriation to benefit from attractive local asset valuation. Resident portfolio flows decline, particularly in the weak flow regime.

Higher domestic growth

A positive growth shock leads to higher resident FDI flows, which warns about negative feedback loops at the current juncture (Figure 17, panel 2). Lower growth dampens FDI (both resident and nonresident) and further weakens economic growth. The coefficient is lower during the weak flow regime, reducing the accelerator effect. Portfolio and other investment flows tend to fall as growth improves, broadly moving in the opposite direction relative to nonresident flows (Figure 17, panel 2, green and gray).

Figure 17. South Africa: Response of Resident Flows
(Percentage point of GDP)



Sources: Bloomberg, Haver Analytics, and IMF staff calculations.Note: The bars represent estimated coefficients with respect to one unit rise in the VIX (left panel) and one ppt rise in the domestic growth (right panel).

[30] This may reflect the persistence effect in flows especially because this paper analyzes the drivers over the near term. The drivers may vary over a longer-term horizon period, which remains a key extension of this paper.

VI. CONCLUSIONS AND IDEAS FOR FURTHER RESEARCH

This paper has analyzed the drivers of capital flows to South Africa using the capital-flows-at-risk methodology. Both nonresident and resident flows were analyzed, including their components by type (FDI, portfolio, and other investment) and sector (banks, corporates, and the sovereign). This is the first paper that applies the at-risk methodology to the capital flows for a particular country.

Several key findings emerged from the estimated results. First, the response of nonresident capital flows varies significantly across different regimes of flows. Global risk aversion is found to be particularly relevant for the likelihood of 'weak' nonresident flows (or during weak flow regimes), while domestic growth for the likelihood of 'strong' nonresident flows (or during strong flow regimes). Such non-linear characteristics of capital flows call for particular vigilance.

Second, key drivers vary across different components of nonresident flows. Portfolio flows are more sensitive to global risk aversion than total flows, particularly during periods of weak flows. The response of portfolio flows to higher global risk aversion declines from periods of weak flows to those of strong flows, similar to total flows, but with stronger sensitivity. Within portfolio flows, debt flows are more negatively impacted by higher global risk aversion than equity flows, especially during periods of weak flows. FDI flows are found to be significantly more levered to domestic growth dynamics, particularly during periods of strong flows. Within portfolio flows, equity flows benefit significantly more than debt flows from stronger growth particularly during periods of strong flows. Tighter domestic financial conditions have a mixed impact on overall flows. A positive impact on debt flows suggests domestic policy rate hikes could usefully reduce the risk of large outflows.

Third, characteristics of sectoral nonresident flows are consistent with earlier findings. High global risk aversion significantly dampens the sovereign sector flows, especially during periods of flow reversals, as these flows are primarily in portfolio debt. Higher domestic growth has a stronger impact during flow surges on both the corporate and banking flows, large shares of which are in equity flows, while little on the sovereign flows.

Fourth, resident flows act as a strong buffer for the economy during episodes of risk off. This is particularly the case with FDI and other investment flows—when global risk sentiment weakens, these flows increase particularly in the strong flow regime while respond little in the weak flow regime. On the other hand, lower growth dampens resident FDI flows and further weakens economic growth. The sensitivity is lower in the weak flow regime, limiting negative feedback loops.

Looking ahead, accelerating the implementation of needed structural reforms is key to boosting growth durably. Prospects for improved domestic growth would attract much needed long-term equity inflows, particularly FDI, which in turn would improve growth potential, therefore creating virtuous feedback loops. Meanwhile, attention needs to be given to volatile external risk sentiment, which plays an important role especially for flows to domestic sovereign debt, and especially during periods of weak flows.

The at-risk methodology is useful for policy makers for several reasons. It allows the assessment of key drivers of capital flows at different stages of a capital flows cycle, that is,

during periods of weak, median, or strong flows. This distinction is especially important for deepening the understanding of the financial stability implications. These models at hand, policy makers would be able to dynamically update their understanding of the changing sensitivity of cross-border capital flows to different shocks, and to calibrate policies.

The capital-flows-at-risk framework could be extended into several directions to further explore the complex mechanism of capital flow drivers. First, the relatively parsimonious equation could be extended to capture further granularities within the push and pull dimensions. Second, the capital flow drivers are not time variant and thus there is value in analyzing how these variables have changed over time. This is especially relevant as capital flow structure and cycle has changed over time. Thirdly, changing the horizon of the forecast analysis can help differentiate between near term and longer-term drivers of the flows. Fourthly, the different types of flows can be modelled jointly as well, instead of standalone regressions that have been deployed in this paper. Lastly, there is a need to extend this framework to analyze the efficacy of different policy options, by interacting policy tools with these drivers.

Many other useful extensions of this paper can offer useful policy implications including: 1) a deeper exploration on which other factors are driving the buffering impact provided by the resident investors; 2) putting South Africa in context with other EMs and teasing out the impact of other variables like central bank credibility, inflation targeting index which are slow-moving in nature and do not work that well in a non-panel setting; 3) exploring the role of fiscal deficits and using that as an interaction term with VIX to analyze if the sensitivity to global risk aversion changes between low and high fiscal deficit regimes.

VII. ANNEX I. FIGURES AND TABLES

Table A1. South Africa: Financial Account Composition
(Percent of GDP)

	Direct investment	Portfolio investment	Financial derivatives	Other investment	Reserve assets	Financial account
1985-93	-0.4	0.0	...	-1.2	-0.3	-2.0
1994-09	1.0	1.5	...	0.2	-0.9	1.8
2010-19	0.0	3.1	0.1	1.1	-0.5	3.9

Sources: Haver and authors.

Figure A1. Nonresident Holdings of Local Assets
(Percent of GDP, IIP Q2 selected data and staff estimates)

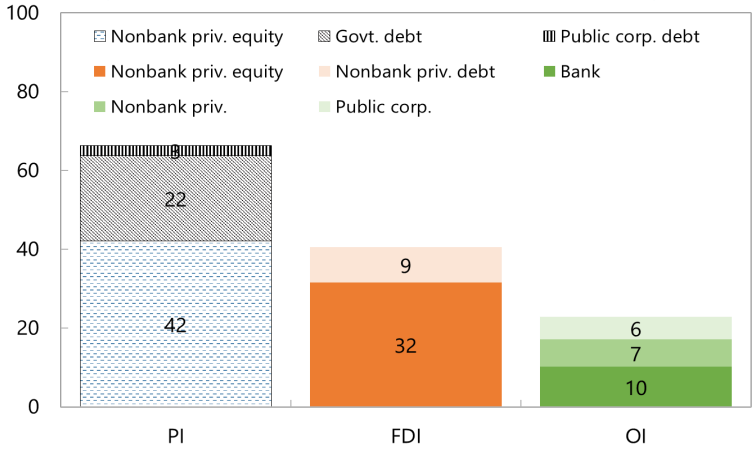


Figure A2. Resident Holdings of Foreign Assets
(Percent of South Africa's GDP, IIP, Q2 2020)

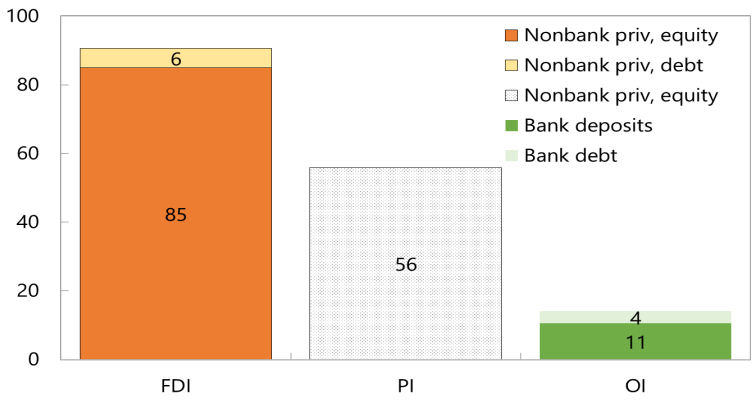


Figure A3. Cross-Border Net Portfolio Flows
(Percent of GDP, 2-quarter moving sum, through Q2 2020)

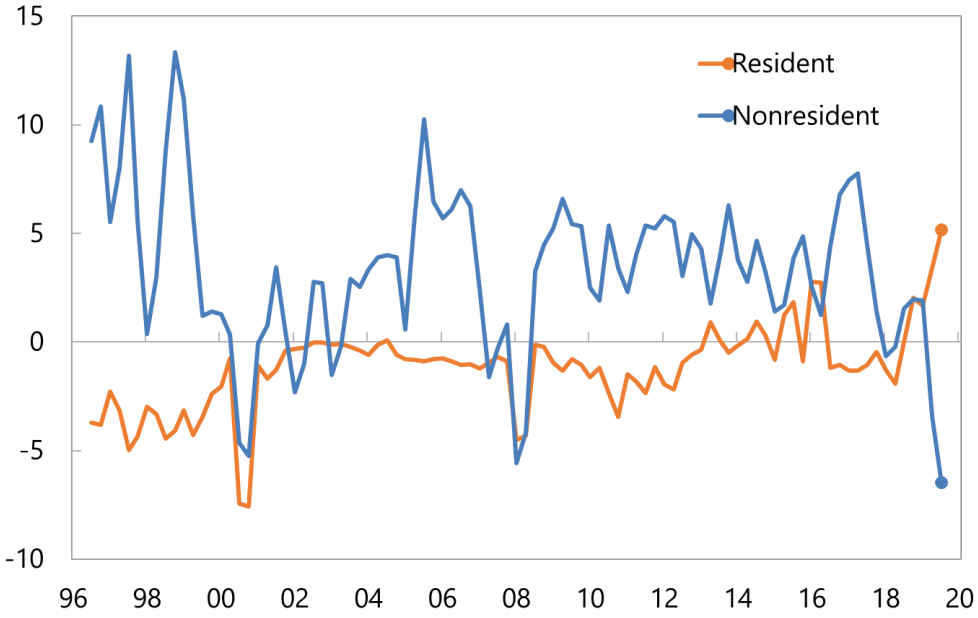
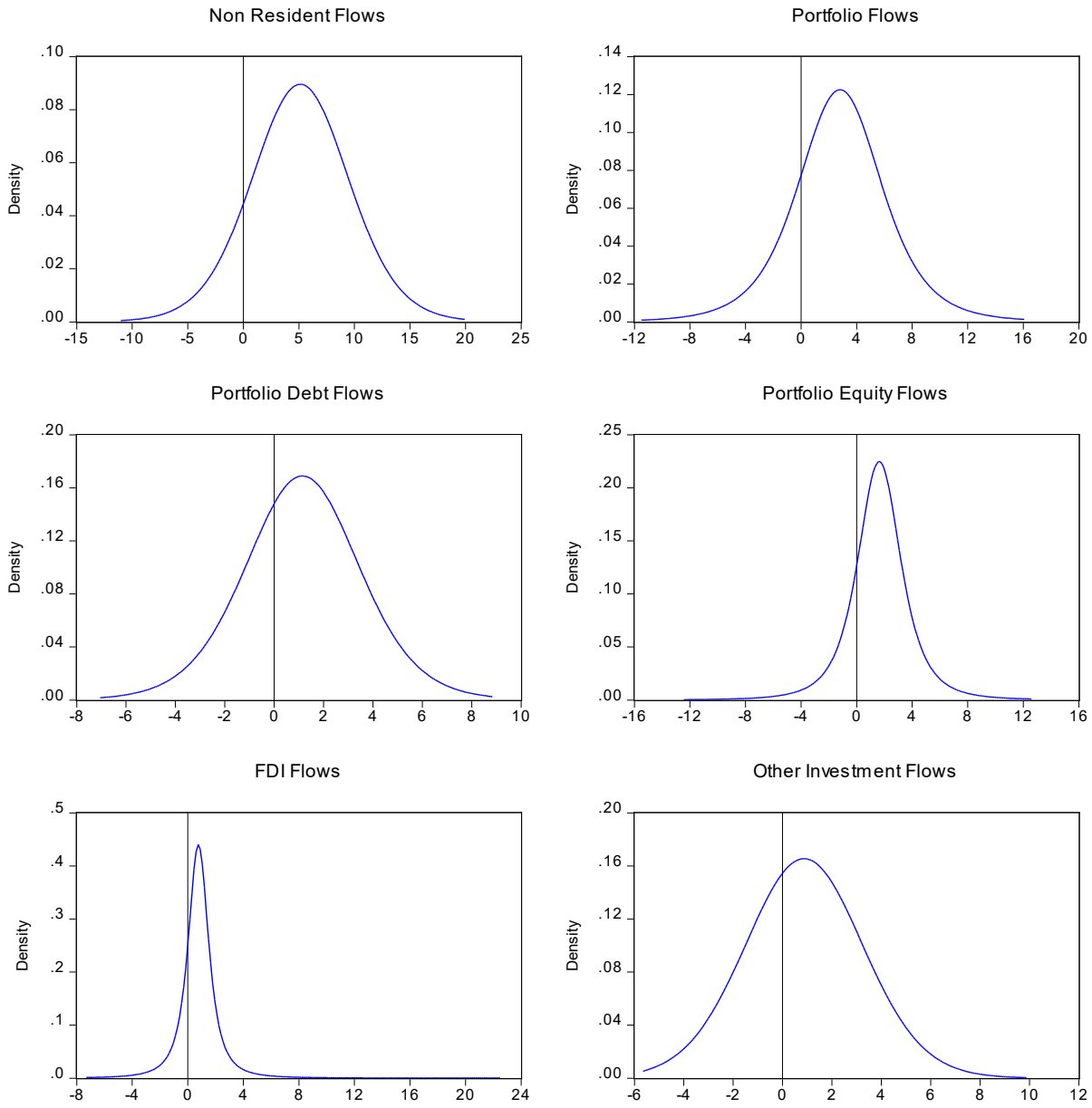


Figure A4. Capital Flows Distributions for Nonresident Flows (Type of flows)—Percent of GDP



Note: The historical data ranges from Q1 1990 to Q2 2019. The data is fitted to a student's t distribution for the purposes of these charts.

Figure A5. Capital Flows Distributions for Nonresident Flows (Sectoral flows)—Percent of GDP

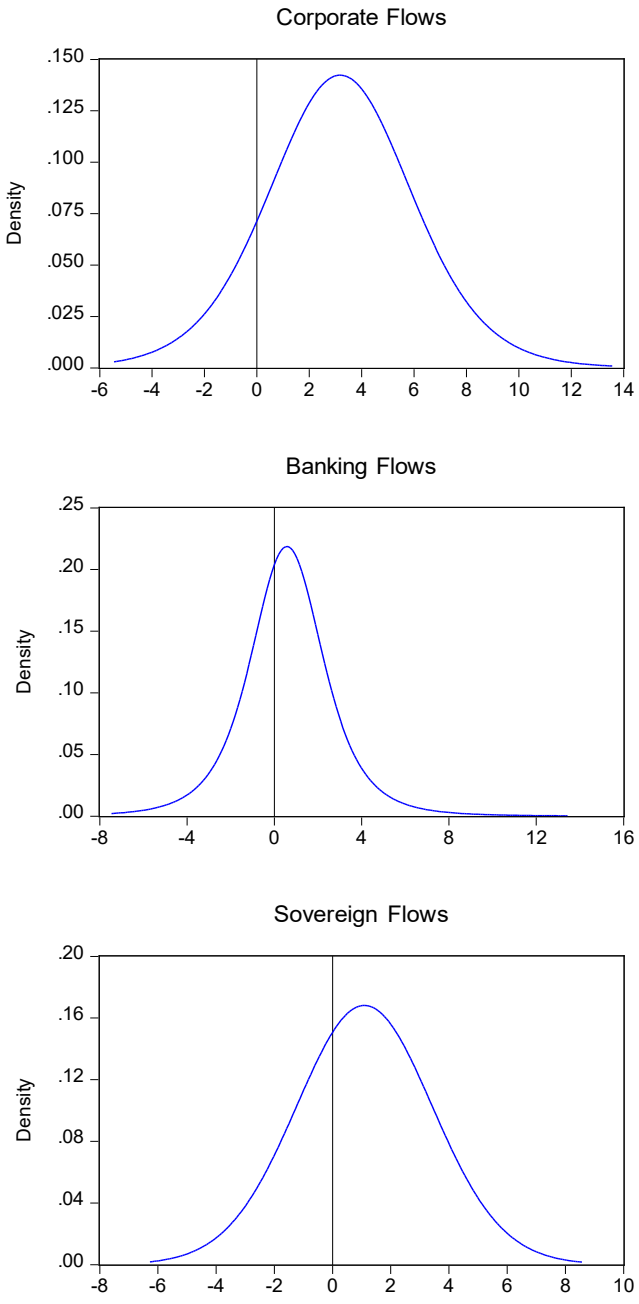


Figure A6. Capital Flows Distributions for Resident Flows (Types of flows)—Percent of GDP

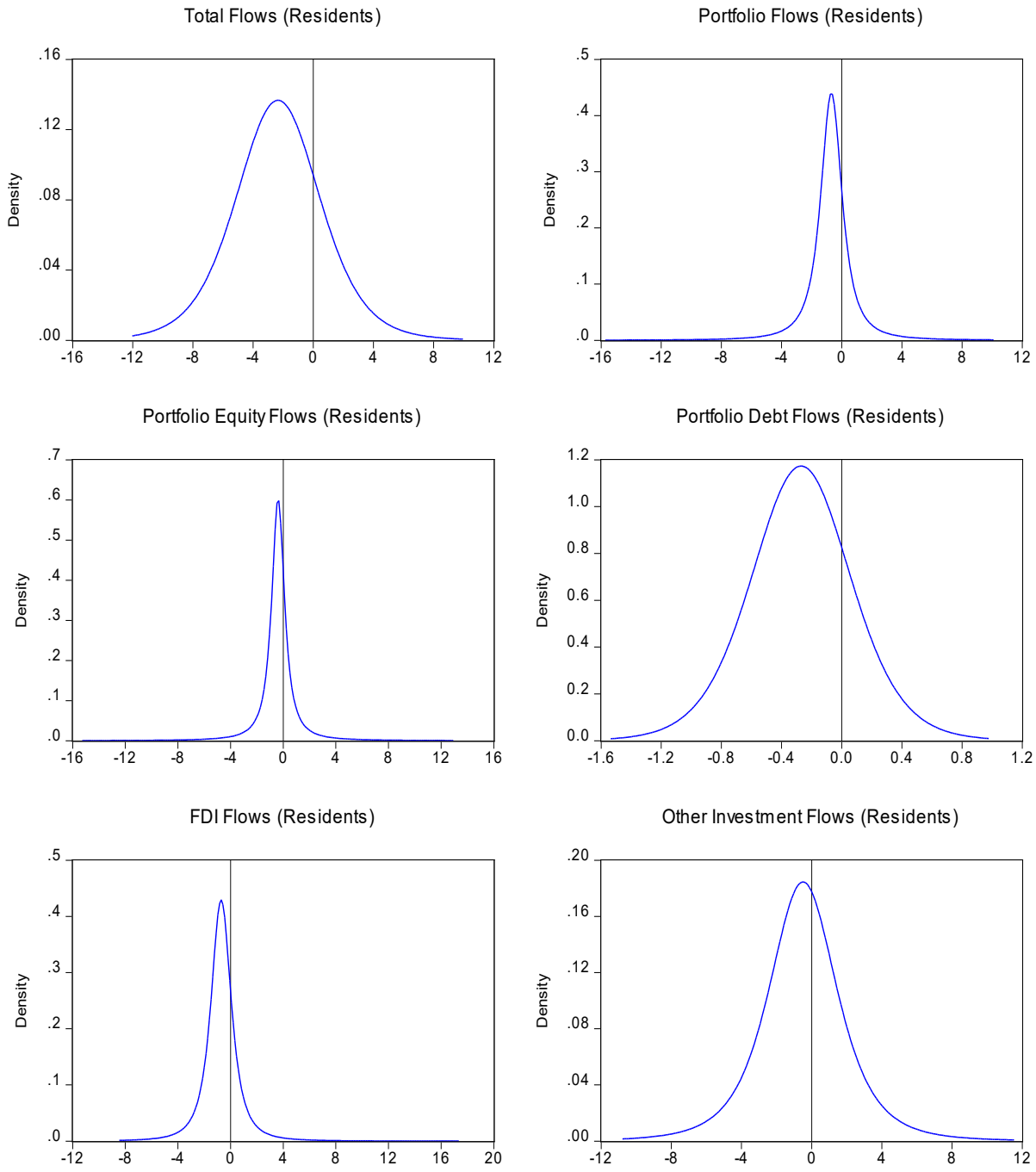
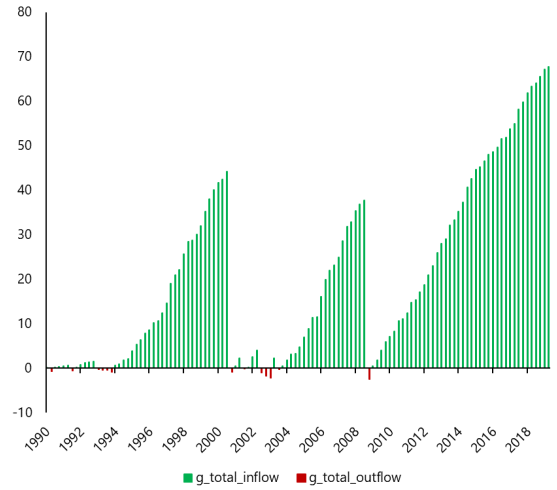
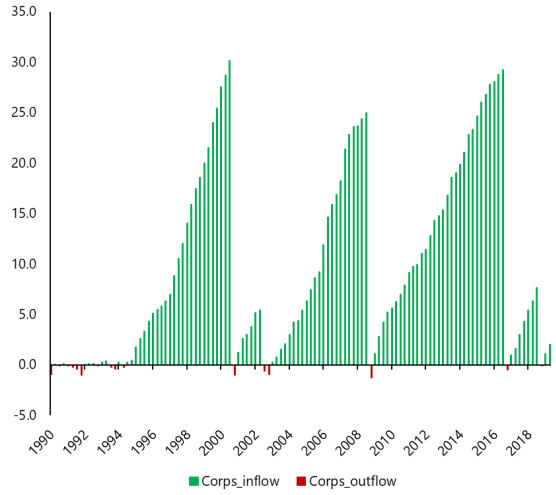


Figure A7. Capital Flows Cycle for Nonresident Flows (Types of flows)—Percent of GDP

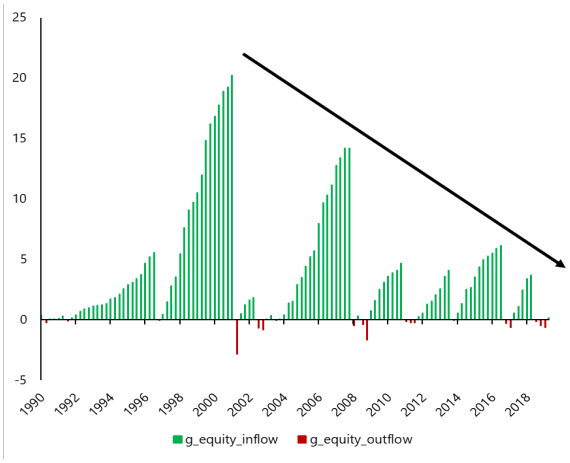
1. Total Nonresident Capital Flows (Percent of GDP)



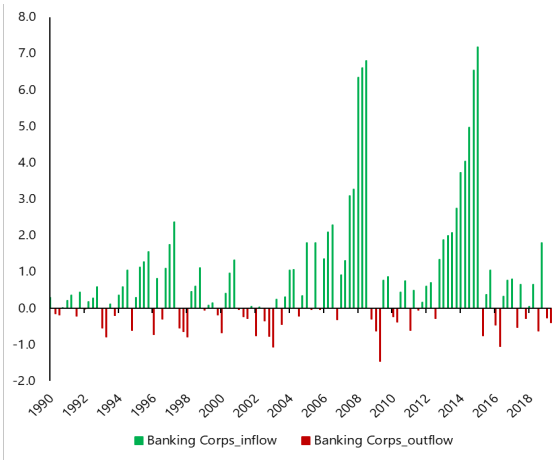
4. Nonresident Corporate Flows (Percent of GDP)



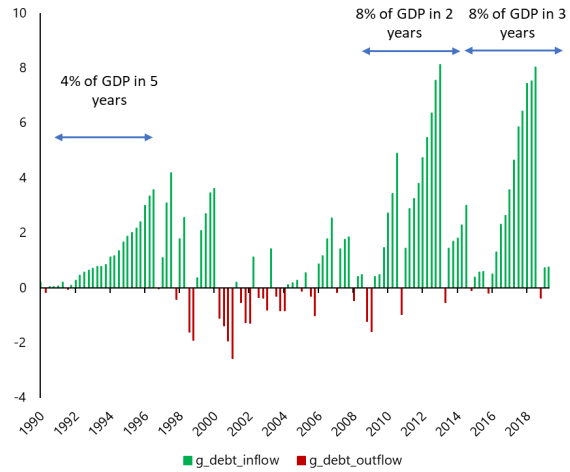
2. Nonresident Portfolio Equity Flows (Percent of GDP)



5. Nonresident Banking Flows (Percent of GDP)



3. Nonresident Portfolio Debt Flows (Percent of GDP)



6. Nonresident Sovereign Flows (Percent of GDP)

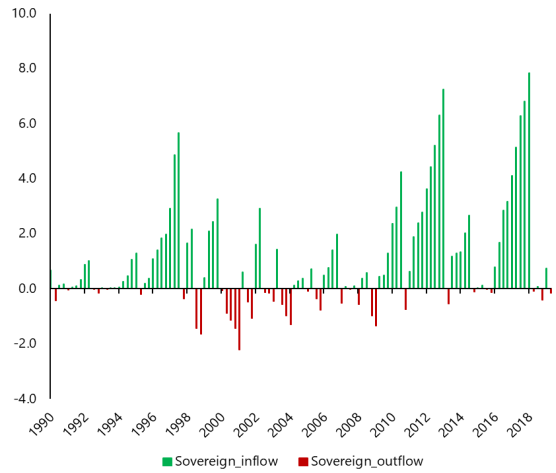
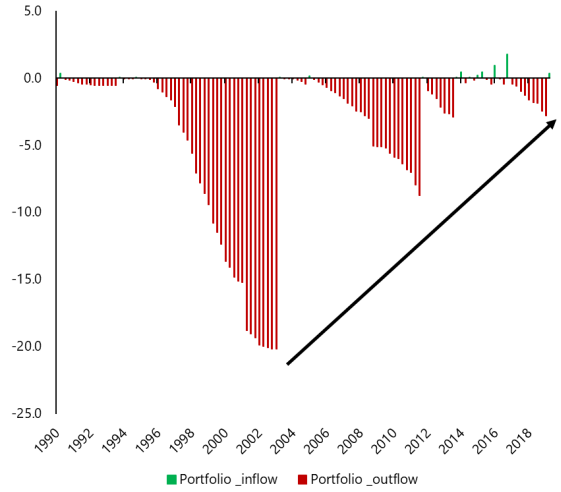
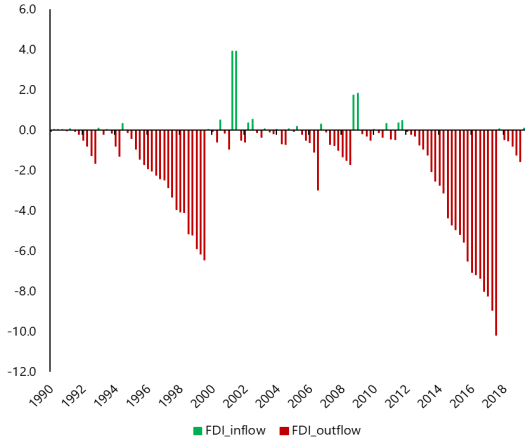


Figure A8. Capital Flows Cycle for Resident Flows (Types of flows)—Percent of GDP

1. Resident Portfolio Flows (Percent of GDP)



2. Resident FDI Flows (Percent of GDP)



3. Resident Other Investment Flows (Percent of GDP)

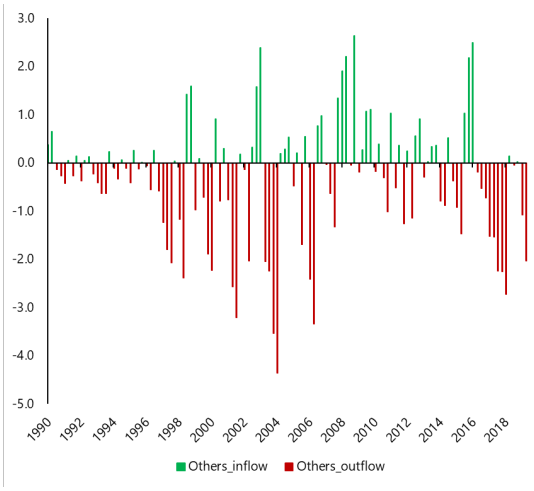


Figure A9. Key Statistics of Different Types of Capital Flows

	Quarterly Flows		Four-quarter average flows	
	Average	Standard Deviation	Average	Standard Deviation
Non-Resident Flows				
Total	6.1	4.6	6.2	2.8
FDI	1.5	2.5	1.5	1.2
Other Investment	1.1	2.6	1.2	1.4
Portfolio	3.5	4.3	3.5	2.8
Portfolio Equity	2.1	2.9	2.1	2.0
Portfolio Debt	1.4	2.8	1.4	1.6
Resident Flows				
Total	-2.8	3.6	-2.8	2.2
FDI	-0.7	2.4	-0.7	1.2
Other Investment	-0.7	3.2	-0.7	1.6
Portfolio	-1.4	2.3	-1.3	1.5
Portfolio Equity	-1.0	2.2	-1.0	1.3
Portfolio Debt	-0.3	0.4	-0.3	0.2
Net Flows				
Total	3.3	3.5	3.4	2.5
FDI	0.8	4.3	0.8	2.2
Other Investment	0.4	4.0	0.5	2.0
Portfolio	2.2	5.0	2.1	3.0
Portfolio Equity	1.1	4.0	1.1	2.1
Portfolio Debt	1.0	2.8	1.0	1.6

Source: Haver Analytics, IMF WEO.
Note: the statistical properties are calculated over 1995-2019.

APPENDIX 1. BUFFERING ROLE PLAYED BY THE RESIDENT FLOWS

While non-resident capital flows play a key role in addressing the external financing requirements, resident flows are equally important when it comes to the balance of payments dynamics. Resident flows are particularly relevant for South Africa, given the buffering role they play especially during the risk-aversion shocks. Smith 2019 shows that the strong counterbalancing behaviour of domestic resident capital flows is a major strength of South African economy. This capital repatriation by domestic residents has prevented four sudden stops from occurring during times when foreign residents were responsible for large capital outflows.

The post-apartheid government had a policy of "gradual" liberalization of exchange controls[31] have significantly eased the ability of South African residents to withdraw capital from the economy, which has enabled a relatively swift movement of resident capital (Mohamed, 2011)). At the same time, there are restrictions on how much foreign exposure residents can have. This helps South Africa in two ways:

1) The limits on foreign ownership implies that South Africa's FX exposure is relatively limited, which is particularly helpful given the elevated rand volatility

2) In a risk-off scenario, the currency depreciates rapidly which pushes the total foreign exposure potentially above the regulated limits in local currency terms. This might encourage the resident institutions to repatriate the assets back to comply with the limits – which provides a natural buffer at a time when the non-resident flows are under pressure.[32]

The experience during the COVID-19 episode further corroborates this trait of South African balance of payments. Total resident flows were at -2.2 percent of GDP in Q1 2020. However, they rose to +4 percent of GDP in Q2 2020 – the first quarter with the full impact of the COVID-19 shock. The positive value implies that residents repatriated the money back in Q2. Out of this, 2.5 percent of GDP was because of FDI flows and 1.5 percent of GDP was because of other flows (including portfolio and other investment flows). The buffering role provided by resident investors in Q2 2020, was true for overall Emerging Markets as well (IMF, 2020)).

Analyzing the resident FDI flow cycle over the longer run corroborates the buffering trend played by these flows as well. While FDI flows have been negative for the most part, but they turned significantly positive during the sell-off episodes in 2000 (4 percent of GDP) and 2008 (2 percent of GDP). The important role played by the FDI flows potentially reflect the inter-company transfer of assets between subsidiaries and headquarters (reference).

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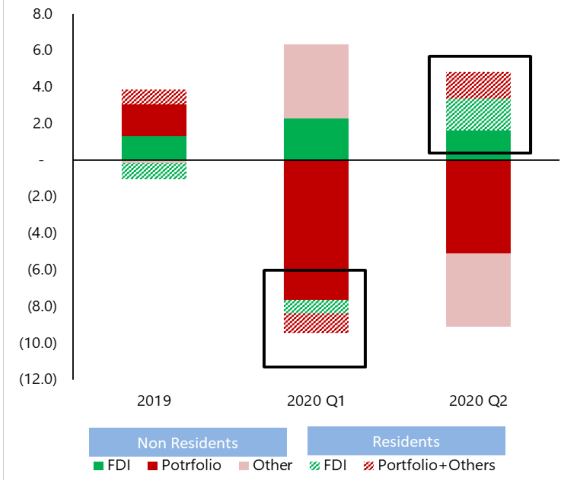
[31] https://www.resbank.co.za/en/home/what-we-do/financial-surveillance/FinSurvFAQ has the details on the latest exchange control regulations. As per SA Banks Act Directive 10 of 2013, prudential limits for foreign exposure ranges between 30-50 percent of total retail assets under management, depending upon the type of the institution. For instance, the limit is 30 percent in the case of pension funds and the non-linked business. On the other hand, it is 40 percent for CIS managers, other institutional investors and the linked business.

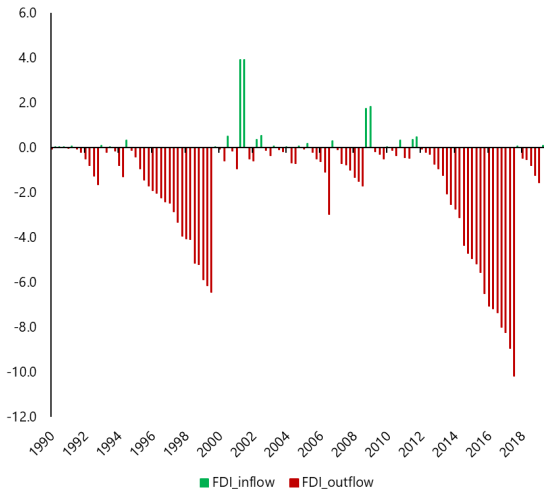
[32] Residents do not have to repatriate the assets immediately but have 6-12 months to comply with the limits. So, the buffering impact can come with a delay. However, from a purely financial perspective, it might help to repatriate the assets when South African Rand is at a highly depreciated level. It is also important to note that this is a negotiated process (and not automatic) which can be protracted in many cases.

Appendix 1. Figure 1. Buffering Role Provided by Resident Flows

1. Split of Net Capital Flows to South Africa during the COVID sell-off
(Percent of GDP)



2. Resident FDI flow cycle over a longer period time
(Cumulative flows since the last turn; as a percent of GDP)



Source: Haver Analytics, IMF Staff Calculations

VIII. REFERENCES

Adrian, Tobias, Nina Boyarchenko, and Domenico Giannone. 2019. "Vulnerable Growth." American Economic Review, 109 (4): 1263–89.

Ahmed, Swarnali. 2017. "The Drivers of Capital Flows in Emerging Markets Post Global Financial Crisis." IMF Working Paper No. 17/52 (Washington: International Monetary Fund).

Arslanalp, Serkan, Dimitris Drakopoulos, Rohit Goel, and Robin Koepke. 2020. "Benchmark-driven Investments in Emerging Market Bond Markets: Taking Stock." IMF Working Paper, No 20/192 (Washington: International Monetary Fund).

Azzalini, A. and A. Capitanio, 2003, "Distributions Generated by Perturbation of Symmetry with Emphasis on a Multivariate Skew t Distribution," Journal of the Royal Statistical Society, Series B, 65, pp. 367–389.

Balli, Faruk, Louis, Rosmy J., & Mohammad Osman. 2011. "The Patterns of Cross-border Portfolio Investments in the GCC Region: Do Institutional Quality and the Number of Expatriates Play a Role?" *Journal of Economics and Finance*, 35(4), 434–55.

Bhundia, Ashok, and Luca Ricci. 2005. "The Rand Crises of 1998 and 2001:What Have We Learned?" in Post Apartheid South Africa: The First Ten Years. Edited by Michael Nowak and Luca Ricci. (Washington: International Monetary Fund).

Brandao-Marques, Luis, Gaston Gelos, Machiko Narita, Erlend Nier. 2020. "Leaning Against the Wind: A Cost-Benefit Analysis for an Integrated Policy Framework." IMF Working Paper, No 20/123 (Washington: International Monetary Fund).

Calvo, Guillermo A., and Carmen Reinhart. 1999. "When Capital Flows Come to a Sudden Stop: Consequences and Policy Options." Working Paper, University of Maryland.

Cecchetti, Stephen, Mancini-Griffoli, Tommaso, Narita, Machiko and Sahay, Ratna. 2020. "US or Domestic Monetary Policy: Which Matters More for Financial Stability?" *IMF Economic Review*, 68(1), 35–65.

Chari, Anusha, Karlye Dilts Stedman, and Christian Lundblad. "Capital Flows in Risky Times: Risk-On / Risk-Off and Emerging Market Tail Risk." Federal Reserve Bank of Kansas City, Research Working Paper no. 20-08, July.

De Bock, Reinout, Dimitris Drakopoulos, Rohit Goel, Lucyna Gornicka, Evan Papageorgiou, Patrick Schneider, and Can Sever. 2020. "Managing Volatile Capital flows in Emerging and Frontier Markets" Guest Post in VOXeu CEPR, August 2020.

Gelos, Gaston, Lucyna Gornicka, Robin Koepke, Ratna Sahay, and Silvia Sgherri. 2019. "Capital Flows at Risk: Taming the Ebbs and Flows." IMF Working Paper No. 19/279 (Washington: International Monetary Fund).

Goel, Rohit and Evan Papageorgiou, 2021 "What drives EM local currency vs hard currency flows and funding costs"; IMF Global Financial Stability Note, forthcoming

Ghosh, Atish R., Mahvash S. Qureshi, Jun Il Kim, and Juan Zalduendo. 2014. "Surges." *Journal of International Economics* 92: 266–85.

Ghosh, Atish R., Jonathan D. Ostry and Mahvash S. Qureshi. 2017. "Managing the Tide: How Do Emerging Markets Respond to Capital Flows?" IMF Working Paper No. 17/69 (Washington: International Monetary Fund).

Gumata, Nombulelo, and Eliphas Ndou. 2019. "Capital Flows, Credit Markets and Growth in South Africa : The Role of Global Economic Growth, Policy Shifts and Uncertainties." Palgrave Macmilan.

Hassan, Shakill. 2016. "Speculative Capital Flows, Exchange Rate Volatility and Monetary Policy: South African Experience." In Contemporary Issues in Development Economics edited by Timothey Besley. Palgrave MacMillan.

Guidotti, Pablo, Federico Sturzenegger, Agustín Villar, and José de Gregorio, 2004. "On the Consequences of Sudden Stops." Economía Vol 4(2): 171–214.

International Monetary Fund. 2017. "Global Financial Stability Report." Washington, October 2017.

_____. 2018a. "Global Financial Stability Report." Washington, October 2018.

_____. 2018b. "Regional Economic Outlook for Sub-Saharan Africa: Capital Flows and The Future of Work." Washington, October 2018.

_____. 2020. "Global Financial Stability Report." Washington, April 2020.

Koepke, Robin. 2019. "What Drives Capital Flows to Emerging Markets? A Survey of the Empirical Literature." *Journal of Economic Surveys*, Vol. 33, No. 2, pp. 516–540.

Korinek, Anton. 2018. "Regulating Capital Flows to Emerging Markets: An Externality View," *Journal of International Economics*, Elsevier, vol. 111(C), pages 61–80.

Kose, M. Ayhan and Eswar S. Prasad. 2020. "Capital Accounts: Liberalize or Not?" IMF Finance and Development, February 2020 (Washington: International Monetary Fund).

Makrelov, Konstantin , Rob Davies, and Laurence Harris. 2019. "The Impact of Capital Flow Reversal Shocks in South Africa: a Stock- and Flow-Consistent Analysis." South African Reserve Bank Working Paper Series 19/05.

Mohamed, Seeraj. 2011. "The Impact of International Capital Flows on the South Africa Economy Since the End of Apartheid" Trust Africa

Ostry, J., A. Ghosh, K. Habermeier, M. Chamon, M. Qureshi, and D. Reinhardt. 2010. "Capital Inflows: The Role of Controls." IMF Staff Position Note 10/04 (Washington: International Monetary Fund).

Park, Hail, 2018. "The cyclical properties of capital inflows in emerging market economies," International Review of Economics & Finance, Elsevier, vol. 56(C), pages 371-382.

Prasad, Ananthakrishnan, Selim Elekdag, Phakawa Jeasakul, Romain Lafarguette, Adrian Alter, Alan Xiaochen Feng, and Changchun Wang. 2019. "Growth at Risk: Concept and Application in IMF Country Surveillance." IMF Working Paper No. 19/36 (Washington: International Monetary Fund).

Rangasamy, Logan. 2014. "Capital Flows : The South African Experience." South African Journal of Economics, 82, 4, December. 551–66.

Smith, Alex. 2019. "Dodging Sudden Stops." South African Reserve Bank Occasional Bulletin of Economic Notes, OBEN/19/01, February 2019n

Shikwane J. M., A. M. de Beer and D. H. Meyer. 2020. "Note on South Africa's Liquidity Measures in Response to the COVID-19 Pandemic." South African Reserve Bank Quarterly Bulletin, June 2020.

Tarashev N., Avdjiev S. and Ben Cohen (2016). "International Capital Flows and Financial Vulnerabilities in Emerging Economies: Analysis and Data Gaps," BIS.

Yeyati, Eduardo Levy and Jimena Zuniga. 2016. "Varieties of Capital Flows: What do we know?" Inter-American Development Bank Discussion Paper IDB-DP-425, April 2016.